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Journal of National Lubricating Grease Institute

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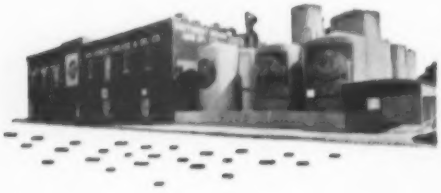

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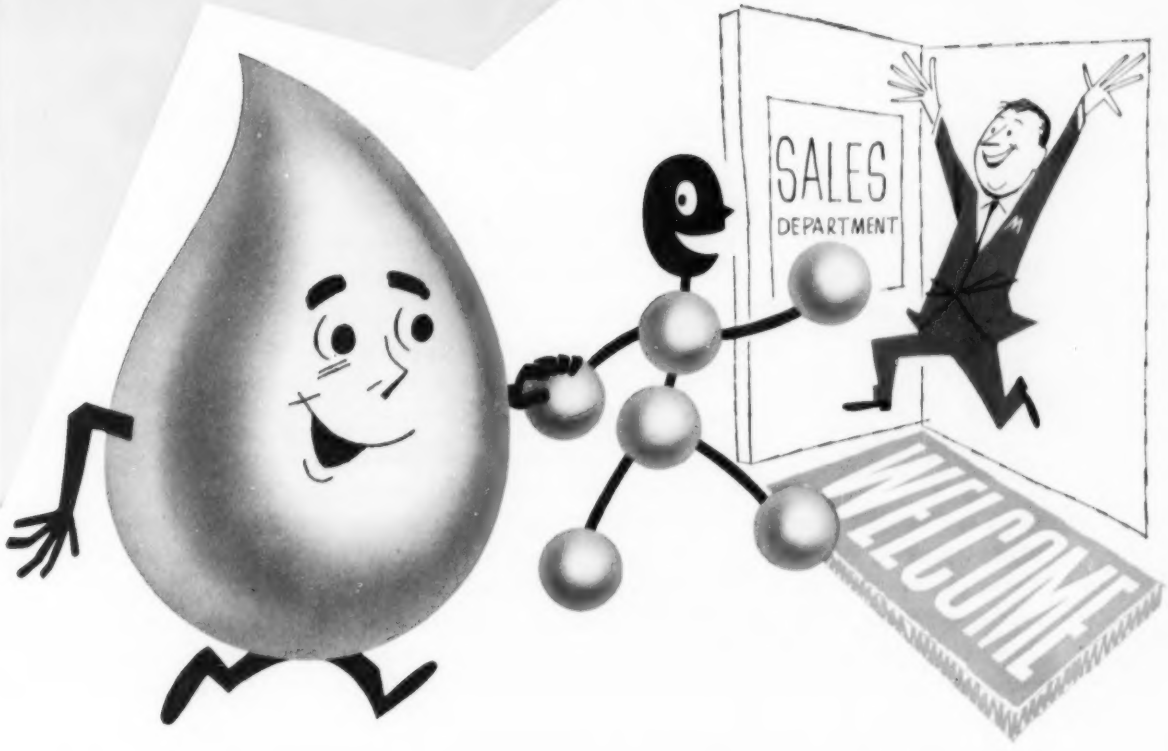

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President's page

by H. L. HEMMINGWAY, President, N L G I

It's Been a Great Year—Thanks to You

October! NLGI Annual Meeting time! Another opportunity to renew old acquaintances, make new ones, and bring ourselves up to date on what's going on in the industry and the Institute.

At Annual Meeting time perhaps we may be forgiven for looking backward just a little to see what has been accomplished in the year since San Francisco.

The 1954-55 NLGI year saw lubricating grease developments and problems spotlighted nationally. Our San Francisco meeting received fine publicity. One whole session of the SAE Summer Meeting in June in Atlantic City was devoted to Chassis Lubricants and Automotive Greases. The feature article of the August National Petroleum News was devoted to chassis lubricant trends. Lubricating greases were also highlighted at the February meeting of the API Lubrication Committee in Detroit, and at the Annual Meeting of the Independent Oil Compounders Association in Chicago in September.

This year also saw the culmination of a truly monumental NLGI cooperative project—the report of the Panel on Delivery Characteristics of Lubricating Greases and Dispensing Equipment, as reported in the last issue of the *Spokesman*. More than seven years in the making, this method should go a long way toward solving one of the industry's oldest and knottiest problems—how to match lubricating greases and dispensing devices.

Since San Francisco, the NLGI Recommended Practices for Lubricating Automotive Front Wheel Bearings booklet which was announced at that meeting, has been widely publicized, and is now referred to in several car or truck manufacturer's Shop Manuals. Nearly 100,000 copies of the booklet have been distributed.

This being my last President's Page, may I express my sincere thanks to the membership for their support, to the NLGI Board of Directors for their loyalty and counsel, to the Executive Secretary and his staff for their attention to the detail which eased my job, to the Committee Chairmen and members for their conscientious work, and to my associates in the Pure Oil Company whose cooperation made it possible for me to spare some time from my regular job.

To the new President my best wishes, and may his tenure in office be as pleasant and rewarding as mine has been.

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Harry F. Bennetts, *Editor*
Joan Swarthout, *Assistant Editor*
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NLGI Spokesman

Vol. XIX OCTOBER, 1955 No. 7

IN THIS ISSUE

ABOUT THE COVER

Artist Ronald Jones glanced through our Annual Meeting program and immediately hit on a theme for this cover. "Let's change the pace," he suggested. "Instead of gears, bearings, service stations, let's put a pastoral scene—make it look different."

Look on page ten and you will see an agricultural and industry scene cleverly presented as dual subjects of this year's meeting.

Later you will see another design on the cover of the Annual Meeting program that is about as different as anything we've ever admired. Congratulations, Ron, you've made a beautiful contribution to the Spokesman and our meeting.

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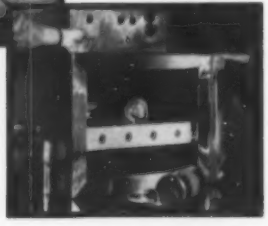

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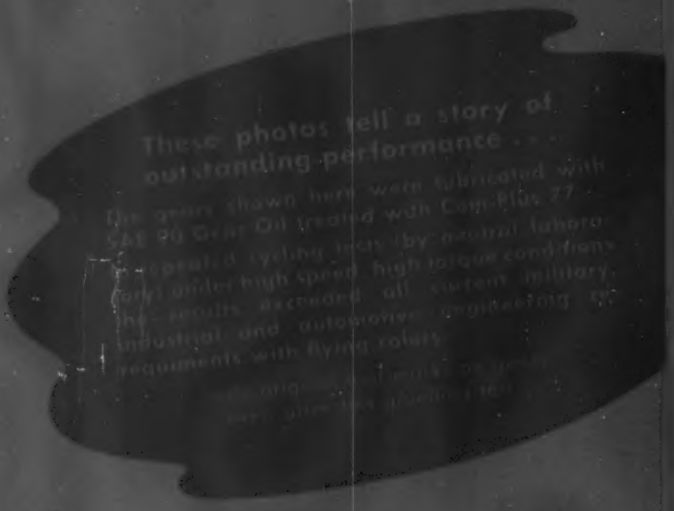
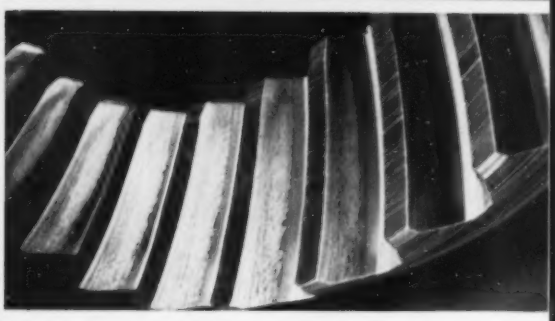
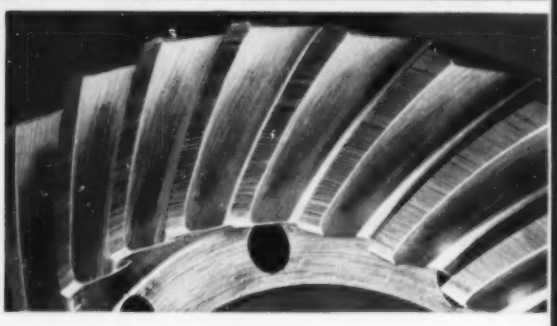




Drive Side
High-Speed
High-Torque
test results



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5. Fuel Oil	Keeps Sludge in Suspension	Prevents Segregation of Moisture
6. Printing Ink Manufacture	Aids dispersion of pigment	Reduces Viscosity of Ink
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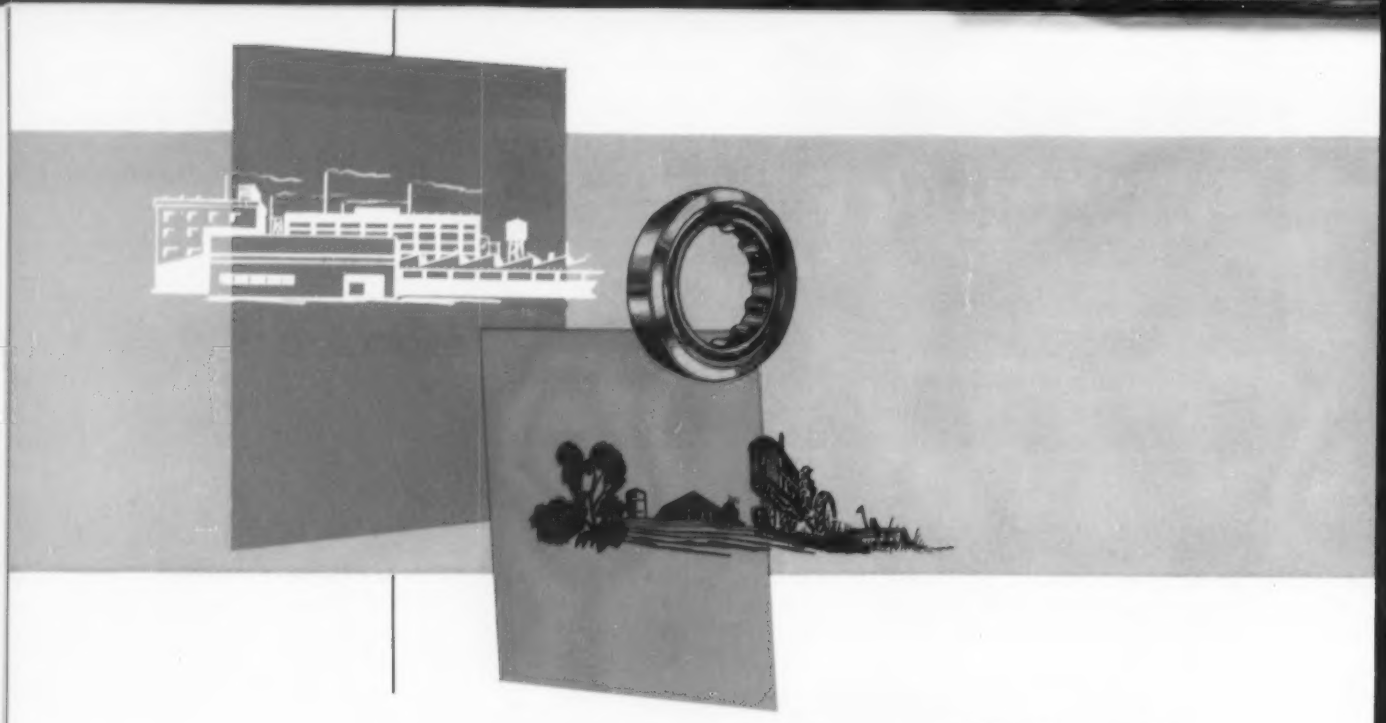


our twenty-third annual meeting

monday, october 31

8:30-10:00 a.m. REGISTRATION

10:00 a.m. ADDRESS OF WELCOME—H. L. Hemmingway, President, NLGI

U. S. NEEDS HIGHWAYS FOR SURVIVAL—Major General Frank D. Merrill, Commissioner of Public Works & Highways, State of New Hampshire

THE FARM MARKET, A GROWING POTENTIAL FOR LUBRICANTS—Fred Bremier, Market Analyst, Curtis Publishing Company

2:00 p.m. PANEL DISCUSSION—LUBRICATING GREASES FOR MODERN FARM MACHINERY

4:30 p.m. ANNUAL BUSINESS MEETING

tuesday, november 1

9:30 a.m. NLGI SYMPOSIUM — FLOW PROPERTIES OF LUBRICATING GREASES

2:00 p.m. COMPARISON OF GREASE BLEEDING TESTS WITH FIELD STORAGE—J. L. Dreher and A. L. McClellan, California Research Corporation

ANTI-OXIDANTS FOR GREASES—S. Fred Calhoun, Rock Island Arsenal Laboratory, Ordnance Corps

HIGH TEMPERATURE ULTRA HIGH SPEED GREASE LUBRICATION —J. P. Dilworth and J. R. Roach, The Texas Company

PICKER LUBE PAY OFF—John Y. McCollister, United Petroleum Corp.

5:45 p.m. SOCIAL HOUR

6:45 p.m. BANQUET—Address: THE OIL OF HUMAN KINDNESS, Honorable H. Roe Bartle, Mayor, Kansas City, Missouri

wednesday, november 2

9:30 a.m. TECHNICAL COMMITTEE SESSION—Chairman, T. G. Roehner

Left to right—
Gen. F. D. Merrill
F. Bremier
M. L. Carter

MONDAY MORNING

W. M. Murray, *Chairman*

u. s. needs highways for survival

Maj. Gen. Frank D. Merrill, Commissioner Public Works and Highways, New Hampshire

Major General Frank D. Merrill has served as Commissioner of Public Works and Highways for the State of New Hampshire since 1949. He is a member of the Highway Study Committee of the Commission on Intergovernmental Relations, and was recently nominated as a member of the Visiting Committee in Civil Engineering for the Corporation of the Massachusetts Institute of Technology, and is First Vice President of the American Association of State Highway Officials.

During the last war he held many important posts, among them being Assistant Chief of Staff for plans and operations under General Stilwell in the China-Burma-India theater of operations, was Commanding General of "Merrill's Marauders," served as Deputy Commander-in-Charge of Administration in the Burma-India theater of operations, and later was appointed Chief of Staff, 10th U. S. Army, for the Okinawa invasion. He later served as Deputy Commander and Chief of Staff of the U. S. Sixth Army in San Francisco, California.

Among his decorations are included the Distinguished Service Medal, Legion of Merit with Oak-leaf cluster, Purple Heart with two Oak-leaf clusters, Commander Order of the Indian Empire, Commander Legion of Honor (Philippines), Order of the Cloud Banner (China), Bronze star medal with cluster, Air Medal, and a special Presidential citation.

the farm market a growing potential for lubricants

Fred Bremier, Market Analyst, Curtis Publishing Co.

Prior to his connection with The Curtis Publishing Company Research Department, Mr. Bremier taught Economics and Transportation at The Wharton School, University of Pennsylvania.

For more than thirty years with Curtis he has specialized in the field of transportation, making surveys, writing reports, books and articles on every product and phase of the automotive industry.

During 1953, he served as Executive Director of the City of Philadelphia Public Buildings Commission, making a space survey and writing the Commission report with recommendations.

Abstract

What word can best describe the changes that have occurred in the industry of farming during the past fifteen years. If the word "revolution" might be considered too

Left to right—
N. A. Sauter
O. L. Bandy
C. J. Boner

strong an appellation in describing what has transpired, certainly the word "evolution" should have universal acceptance. While changes in farming have been continuously underway during the past 35 years, the transition toward mechanization has greatly accelerated since about 1940. During this unparalleled period of change in farming, the noteworthy feature has been the tremendous increase in the ownership and use of machinery and mechanical power.

The petroleum industry has been a vital factor in this farming evolution. By providing the fuel and lubricants for farm tractors, passenger cars, trucks, stationary engines, mounted motors and oil powered machines, the petroleum industry merits a major part of the credit. In addition, petroleum products have contributed immeasurably to improving living conditions on the farm with fuel for heating and cooking. Also, farm efficiency has been increased by the use of petroleum fuels in crop drying equipment, in providing protective heat for raising young animals, preventing frost damage to crops and weed burning. Oil-based insect sprays for house, barn and fields can likewise claim credit for improving farm efficiency.

A series of 18 charts presenting information on the recent advances in farm use of petroleum products, farm output, farm income and operation provides background in support of the title "The Farm Market, A Growing Potential for Lubricants."

MONDAY AFTERNOON

J. W. Lane, *Chairman*

panel discussion—"lubricating greases for modern farm machinery"

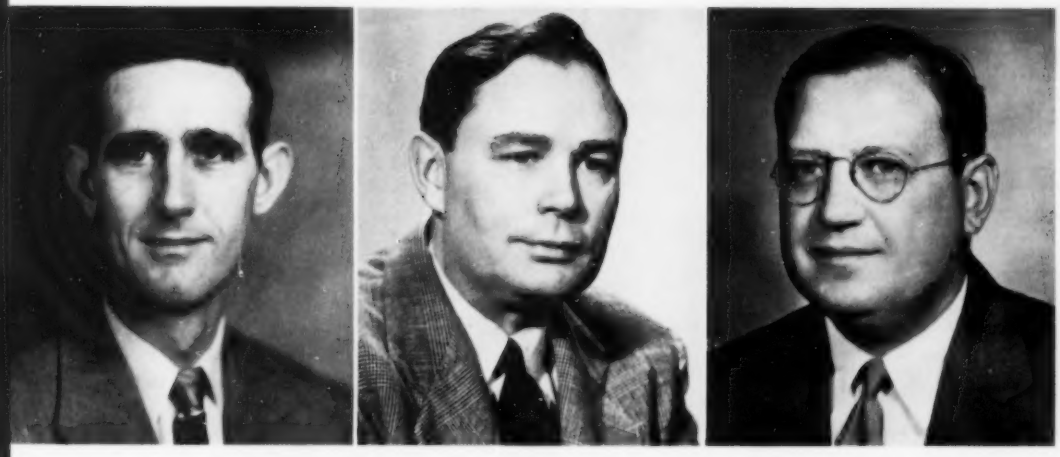
Panel Chairman—M. L. Carter, Southwest Grease and Oil Co.

M. L. Carter obtained his B.S. degree in Chemistry from Kansas State College and his Masters degree in Chemistry in 1941. Two years were then spent with the Kansas State Highway Materials Testing laboratory. In 1943, Mr. Carter joined the Southwest Grease & Oil Co., Inc. of Wichita, Kansas. He is now treasurer and Chief Chemist of that Company.

Modern Farm Machines Need Modern Greases

N. A. Sauter, Deere & Company

N. A. Sauter graduated from Washington University, St. Louis, Missouri wtih a B.S. in Chemical Engineering. Following graduation Mr. Sauter became an industrial lubrication engineer for Socony Mobil Oil Company and is presently in the Materials Engineering department of Deere & Company. He is a member of ASLE, ASL and a Registered Professional Engineer.



Left to right—
W. L. Bowers
D. O. Hull
N. Marusov

Lubricating Equipment for Modern Farm Machinery

Owen L. Bandy, Lincoln Engineering Company

Owen L. Bandy graduated from Iowa University as a mechanical engineer in 1938. He served as a U. S. Navy Maintenance & New Construction Engineer until 1946 when he purchased a 600 acre farm which he operated for seven years. Mr. Bandy became a field engineer to Lincoln Engineering Company in 1953 where he is presently located.

Contribution of the Lubricating Grease Industry to Lubrication of Modern Farm Machinery

C. J. Boner, Battenfeld Grease and Oil Corp.

C. J. Boner has spent a major portion of his working career—almost thirty years, with the Battenfeld Grease & Oil Corporation. His attempts to understand the factors which influence the structure and performance of lubricating greases culminated in his recent book, "Manufacture and Application of Lubricating Greases." For several years he has headed a Sub-Committee who provide papers for publication in the NLGI SPOKESMAN.

Let's Modernize Lubrication of Modern Farm Machinery

Wendell Bowers, Agriculture Engineering Dept., University of Illinois

Born and raised on a 520 acre livestock farm near Danville, Illinois, Mr. Bowers received his degree in Agricultural Engineering from the University of Illinois in 1948. He then farmed for two years and taught farm machinery courses at a small college in Alfred, New York. In 1951 he took his present job as Extension Farm Machinery Specialist, conducting meetings and demonstrations in all phases of farm machinery.

Farmer Preference in Agricultural Lubricating Greases

Dale O. Hull, Agricultural Engineering Dept., Iowa State College

Dale O. Hull holds the rank of associate professor and Extension Agricultural Engineer at Iowa State College. Hull received his B.S. degree and master of science in 1940 from that college.

He was appointed to the ISC staff October 1, 1945 and was promoted to associate professor in June of 1954. Previous positions were held with the Standard Oil Company as automotive engineer and lubrication engineer from 1940 to 1945. During graduate work Hull was a research associate for the Agricultural Experiment Station. He is a member of ASAE, SAE, Alpha Zeta, and Phi Kappa Phi.

Left to right—
H. Eyring
E. O. Forster
J. Kolfenbach

TUESDAY MORNING

W. M. Murray, Chairman

symposium—flow properties of lubricating greases

Panel Chairman—N. Marusov, Gulf Research and Development Company

Mr. Marusov earned his B.S. degree in General Engineering at the University of Pittsburgh in 1943 and was employed as an Instrument Development Engineer in the Engineering Division of the Gulf Research & Development Company.

One of his assignments as an Instrument Engineer was the development of Gulf's Pressure Grease Viscometer. It was during this assignment that Mr. Marusov's interests were directed toward the study of flow behavior of non-Newtonian materials.

Because of his interest in the subject, he was transferred to the Lubrication Section of the Engineering Division.

He joined the NLGI Dispensing Panel as a member in 1950 and, in 1953 was appointed to succeed L. C. Brunstrum as Chairman of that NLGI Subcommittee.

I. Basic Studies—Flow Properties of Lubricating Greases

Dr. Henry Eyring, Professor, University of Utah

Dr. Eyring has been vice-president of the American Association for the Advancement of Science, chairman of its Chemical Section and receiver of the Ninth Award of the same association in 1932. His major fields of specialization include radioactivity, the application of quantum mechanics to chemistry, the theory of reaction rates, and the theory of liquids. Dr. Eyring is a graduate of the University of Arizona and received his Ph.D. in Chemistry from the University of California. In 1946 he became Dean of the Graduate School and Professor of Chemistry at the University of Utah.

Abstract

A critical review of basic principles of flow of non-Newtonian fluids from the molecular viewpoint.

Fibers, Forces, and Flow

E. O. Forster, J. J. Kolfenbach, H. L. Leland, Esso Research & Engineering Co.

Eric O. Forster received his B.S. and Ph.D. in physical chemistry from Columbia University in 1949 and 1951, respectively. After his graduation, he joined the Esso Research and Engineering Company where he is a research chemist in the industrial lubricants section. He is a member of the A.C.S. and Sigma Xi.

J. J. Kolfenbach obtained the B.A. degree from Loras College in 1939, and his Ph.D. in biophysical chemistry from Iowa State College in 1944. He had been associated with the Esso Research and Engineering Company since 1944. He is a group leader in the industrial lubricants section. He is a member of A.C.S., Sigma Xi, and S.A.E.

Left to right—
H. L. Leland
L. C. Brunstrum
R. H. Leet

Hollis L. Leland received the B.S. degree in chemical engineering from the University of Maine, the M.S. degree from the University of New Hampshire and the Ph.D. from Ohio State University in 1937, both in physical chemistry. He has been associated with the Esso Research and Engineering Company since 1937, where he is Head of the Industrial Lubricants Section. He is a member of A.C.S., Sigma Xi, S.A.E. and ASLE.

Abstract

It is generally believed that the structure of a soap base grease can be represented as a three dimensional network of soap fibers. To predict the grease's tendency to yield to stress, it is necessary to know what the forces are that hold the fiber network together. This knowledge will give a better basis for future prediction of grease flow properties.

By means of X-ray diffraction and electron microscope studies, it has been possible to establish the structure of the fiber network and calculate the forces holding it together. Evidence is presented to show that the basic crystal structure of the soap fiber is the same as that of the original soap exposed to the same heating cycle. The forces holding soap molecules in soap fibers are the same as those effective in the original soap.

The formation of a three-dimensional network of soap fibers is attributed to the ability of the soap fibers to stick to each other at points of mutual contact. At these points, forces similar to those effective within the soap fibers became operative between the fibers.

II. Rheological Measurements—

Capillary Viscometry of Grease

L. C. Brunstrum and R. H. Leet, Standard Oil Co. (Indiana)

L. C. Brunstrum has been a member of the research department of the Standard Oil Company (Indiana) since he received his B.S. in chemical engineering from Armour Institute of Technology in 1929. He is currently the section leader in charge of greases and industrial lubricants, member of the A.C.S., Society of Rheology, and A.S.L.E.

Richard H. Leet received his B.S. in Chemistry at North West Missouri State College in 1948. He received his Ph.D. in Physical Chemistry from the Ohio State University in 1952. After his graduation, he joined the Whiting Laboratories of Standard Oil Company (Indiana) where he is a research chemist. He is a member of ACS, MAIC, and the Society of Rheology.

Abstract

Detailed knowledge of the viscosity, or flow resistance, of grease is necessary in attacking practical and theoretical problems. Measurement of flow rates and pressures through capillaries is not difficult but interpretation of results is, because of the complex nature of the flow.

Interpretation may be made mathematically in four ways: The commonest is that of the ASTM method, which prescribes the apparatus but ignores several recognized inaccuracies; the observations are treated as though grease were a fluid and lead to an "apparent viscosity." Another way, which may be applied to observations from many capillary viscometers, leads to viscosity at the capillary wall only; the results do not differ greatly from "apparent viscosity." A third way calculates yield value and mobility on

Left to right—
R. N. Weltmann
L. C. Rotter
E. F. Koenig

the premise that grease flows like a Bingham plastic; tables of dimensionless constants simplify the calculations. A fourth way takes a theoretical approach and determines an equation from flow data through Eyring's relaxation theory for viscous flow.

The choice depends upon the problem. For specifications and empirical relations in lubrication problems, "apparent viscosity" and viscosity at the capillary wall may be used. Yield value and mobility could be used for calculating pressure drops in pipes as well as for specifications. Eyring's equation may permit correlating flow behavior with such factors as size, shape, weight, distribution, and surface properties of thickener particles.

Rheological Measurements and Their Application to Pipe Flow Properties

Ruth N. Weltmann, NACA Lewis Flight Propulsion Laboratory

Ruth N. Weltmann (Mrs. S. J. Begun) studied at the Institute of Technology in Berlin, Germany, majoring in Physics (equivalent of M.S.). She worked as a physicist at the Research Laboratories of the Interchemical Corporation in New York City, New York, from 1936 to 1947. She has been employed at the NACA Lewis Flight Propulsion Laboratory, Cleveland, Ohio, as a physicist since 1948.

Several of her papers have been published in scientific journals and NACA Technical Notes in the fields of rheology and instrument. She has also collaborated on a chapter on "Thixotropy" in Volume V of "Colloid Chemistry."

Abstract

Pressure losses in pipe lines when carrying Newtonian liquids can be readily calculated, if the Newtonian viscosity is known. For non-Newtonian materials pressure losses in pipe lines can be predicted if the non-Newtonian flow properties are known at that rate of shear to which the material is being subjected during its passage in the pipe line. Since lubricating fluids and greases are frequently non-Newtonian materials, their non-Newtonian flow properties have to be determined and used to predict the pressure losses in lubricating systems of various sizes and under different flow conditions. The measurements of non-Newtonian flow properties with a concentric-cylinder rotational viscometer is reviewed and the most important design features of such an instrument are briefly discussed. Flow curves of lubricating materials, recorded on the NACA automatic viscometer are presented. The non-Newtonian flow properties of these lubricants are determined from these flow curves and are used to demonstrate the calculation of pressure losses for different pipe line systems and flow conditions.

III. Practical Application of Rheological Constants—

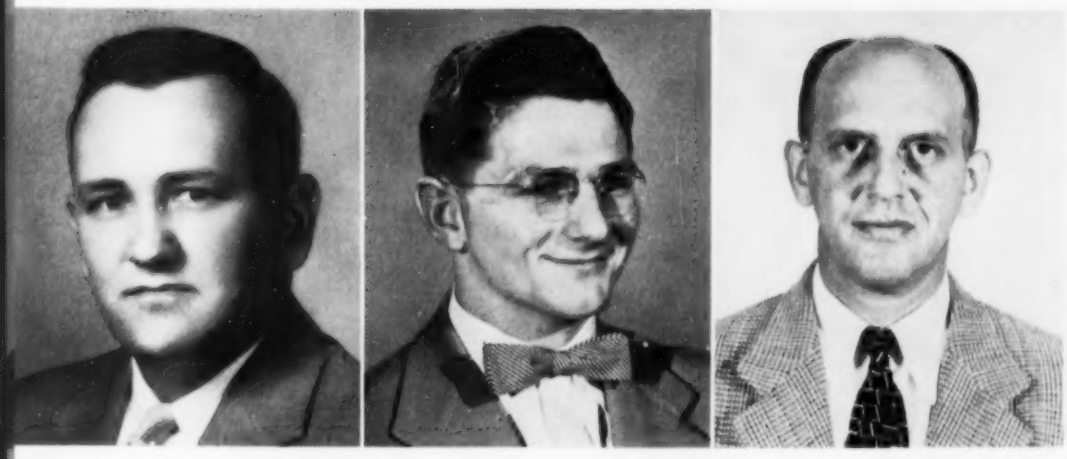
Equipment Aspects in Dispensing Grease

L. C. Rotter, Lincoln Engineering Co.

L. C. Rotter is a graduate of Washington University in both Electrical and Mechanical Engineering. He is a member of SAE, ASME, NSPE, and MSPE. In 1927 he joined Lincoln Engineering Company, where he became Chief Engineer in 1937.

Abstract

Originally industry was satisfied with a pump that would pump grease. This is not true



Left to right—
E. M. Johnson
E. A. Baniak
J. S. Aarons

in these days of "Automation." It is required to dispense grease through various lengths and sizes of supply line. With Oil, Viscosity is a criterion of pumping. A common language of terms, such as, "Apparent Viscosity" would permit the equivalent in connection with grease.

Predicting Pressure Drops in Grease Distribution Equipment

E. F. Koenig, E. M. Johnson, E. A. Baniak, The Texas Company

Mr. Koenig received his B.S. degree in Chemical Engineering from the University of Minnesota in 1936 and continued graduate work for one year. He is a member of ACS and SAE.

Prior to joining the Beacon Laboratories of The Texas Company in 1941, he worked a short time for The Minneapolis-Honeywell Company and three years for McLaughlin, Gormley, King and Company of Minneapolis where he was associated with plant production of insecticides.

His first two years with The Texas Company were spent in the Analytical & Testing Department and the remainder of the time in the Products Application Department where he has been associated with the various phases of engine and mechanical testing of fuels and lubricants. He has been Supervisor of the Products Application Department since 1951, having previously held the positions of Engineer, Group Leader and Assistant Supervisor, respectively.

Mr. Johnson is a native of Worcester, Massachusetts, where he received his formal education, graduating from Worcester Polytechnic Institute in 1944 with the degree of BSME.

Following service in the U. S. Navy, he joined the Beacon Laboratories of The Texas Company in 1946. He has been continuously assigned to the Products Application Department where he has been associated with the engine evaluation of fuels and lubricants, as well as the mechanical evaluation and application of greases and industrial lubricants. He has recently been made Supervisor of his department, having previously held the positions of Engineer, Group Leader and Assistant Supervisor. He is a member of SAE.

Mr. Baniak graduated from West Virginia University in 1951 with the degree of BSME.

He was employed as a Mechanical Engineer by The Texas Company at its Beacon Laboratories, Beacon, New York, in 1951. His experience has included evaluations of fuels and lubricants in engines, with considerable work in the evaluation and application of greases and industrial lubricants on bearings and gears.

Mr. Baniak is a member of ASME, Tau Beta Pi and Pi Tau Sigma.

Abstract

When designing centralized grease lubrication systems, the effect of tube size and length is of utmost importance. This paper presents work done on various greases of different soap types and percentages to determine the correlation between pressure

Left to right—
J. L. Dreher
A. L. McClellan
S. F. Calhoun

drop in grease distribution system elements and apparent viscosity of the grease used. A useful correlation between these factors has been developed for various delivery tubing sizes. Similar data have been developed for a Trabon header block. The accuracy of the methods presented are ±5 per cent and ±10 per cent when predicting pressure drops for tubing or a Trabon header block, respectively.

Pumpability of Steel Mill Greases

J. S. Aarons, National Tube Division, U. S. Steel Corp.

J. S. Aarons received his B.S. degree in Chemistry from the University of Connecticut in 1929. In 1931 he joined U. S. Steel Corporation with whom he is connected to date, working in the National Tube Division of the Lubricants Testing Laboratory.

Abstract

The paper, arranged in two parts, describes the need for laboratory evaluation of greases since the development of centralized lubrication systems.

In the first part, in addition to the accepted methods, a testing unit is described which checks pumpability of greases quite readily. The machine is very compact and is well suited for use in a small laboratory where space is at a premium. Data on pumpability rates of various greases at low temperatures is discussed.

The second part of the paper deals with correlation of laboratory results and actual field practice. More data is presented on the selection of a grease for low temperature work and field experience is related.

TUESDAY AFTERNOON

H. L. Hemmingway, *Chairman*

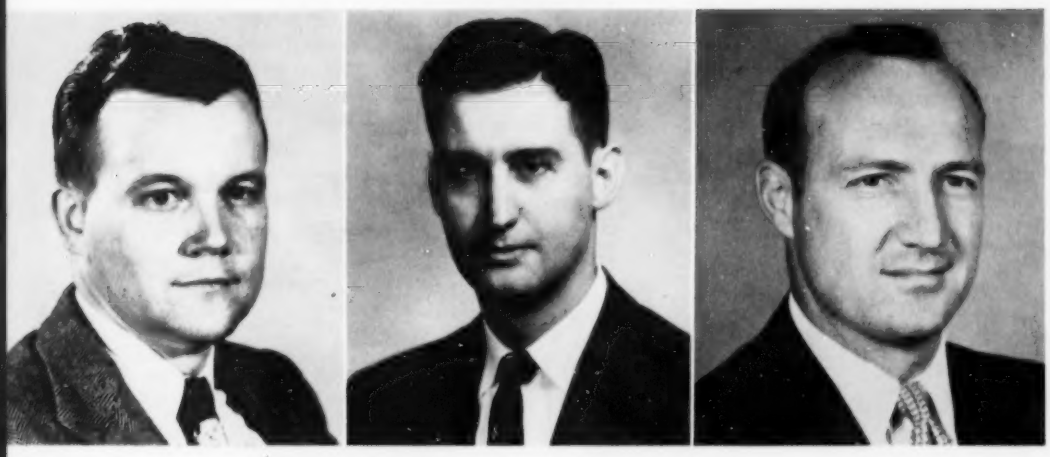
comparison of grease bleeding tests with field storage

J. L. Dreher and A. L. McClellan, California Research Corp.

J. L. Dreher obtained his A.B. degree in chemistry from UCLA in 1935. He then was employed by General Petroleum Corporation in Los Angeles. In 1944 he joined Metallurgical Laboratories (Atomic Bomb Project) at the University of Chicago. He transferred to Hanford Engineering Works (Du Pont) in Richland, Washington, in 1944 and to California Research Corporation (Standard Oil Company of California) in 1945.

Mr. Dreher is a member of the American Chemical Society, Alpha Chi Sigma, ASLE, and AAAS.

A. L. McClellan obtained a B.S. in chemistry from Centenary College of Louisiana and an M.S. and Ph.D. in physical chemistry from the University of Texas. After two years of postdoctoral training at the University of California and one year at Massachusetts Institute of Technology, he joined the California Research Corporation in 1951. He was in the Grease and Industrial Lubricants Division and leader of the project on Fundamental Research on Greases until May 1955. He is now Staff Assistant to the General



Left to right—
J. P. Dilworth
J. Y. McCollister
J. R. Roach

Manager of the Laboratory.

He has published about 12 papers on the infrared spectra of naphthalene using polarized radiation, fretting corrosion, gas adsorption on metals, and physical properties of greases.

anti-oxidants for greases

S. Fred Calhoun, Chemist, Rock Island Arsenal Laboratory, Ordnance Corps

S. Fred Calhoun grew up in southeastern Iowa and received a B.S. in chemistry from Iowa Wesleyan College in 1926 and an M.S. in chemistry from the University of Iowa in 1931. While in college he served as research assistant and did work on chlorination of fatty acids and the ethanol-carbon tetrachloride system. He taught chemistry in the schools of Geneseo, Illinois, and in 1952 he joined the research staff of Rock Island Arsenal and has done work on synthetic lubricants, oil separation, anti-oxidants, and other problems in the field of greases. He is a member of ACS.

Abstract

The development of new machines and devices, by both the Armed Services and Industry, has made it imperative that a grease be able to function for long periods of time during continuous or intermittent service at higher than ambient temperatures. The present practice is to use an additive to protect a grease against oxidation under such conditions. It was desired to compare the presently used additives and to develop new ones with the view of raising the temperature range for which they were effective.

A total of 69 different compounds or formulations have been examined for their inhibiting ability in a variety of grease types and in several concentrations. Oxidations were run at 210° F. and 250° F. and the results tabulated. Acid and base numbers and copper corrosions were also determined for all greases containing inhibitors which showed any promise. Graphs showing the different types of oxidation curves obtained are included.

high temperature ultra high speed grease lubrication

J. P. Dilworth and James R. Roach, The Texas Company

James R. Roach is a Chemist in the Grease Research Department of The Texas Company's Beacon Laboratories. Mr. Roach is a native of Malta, Montana, but considers Chester, Montana as his home. He received his B.S. in Chemistry from Montana State College in 1947. He has been a member of Beacon Laboratories since July of that year.

J. Perry Dilworth is a native of Arkansas City, Kansas, but he considers Winfield, Kansas, his home town. He received his early education there and also attended the local Southwestern College for one year. He received his B.S. in Industrial Chemistry from Kansas State College in 1939.

Mr. Dilworth joined The Texas Company's Beacon Laboratories in June, 1939, as a Chemist in the Analytical and Testing Department. He is presently serving as Acting Supervisor of the Grease Research Department.

Abstract

The performance of a new mixed soap-solid thickened synthetic oil grease is discussed. This new product contains a non-silicone type oil and is the result of con-

tinuing research work directed towards the development of wide temperature range greases satisfactory for high speed bearing lubrication. This grease will satisfactorily lubricate ball bearings over the approximate temperature range of −65 to 450° F. Typical physical and chemical tests are shown for this grease. Low temperature and high temperature properties are compared with present MIL-G-3278 and MIL-L-3545 specification greases. High temperature performance data up to 450° F. at 10,000 r.p.m. are presented. The ability of this product to lubricate at high rotative speeds as well as at high temperatures is emphasized. The importance of this factor in lubricating aircraft accessory equipment is pointed out and the performance of this grease in full scale aircraft accessory equipment is discussed.

picker lube pay off

John Y. McCollister, Vice President, United Petroleum Corp.

John Y. McCollister graduated from the University of Iowa with a B.S. degree in Commerce. Following graduation he served in the United States Navy as Radar officer on the cruiser Birmingham in the Western Pacific during World War II.

In 1946 he was employed by International Business Machines Corporation as an accounting machine salesman. In January 1952 he was made IBM Special Representative to the Meat Packing Industry throughout the United States.

Mr. McCollister resigned from IBM in July, 1953 to become Vice President & Sales Manager of United Petroleum Corporation, Omaha, Nebraska.

Abstract

This paper discusses the development and marketing of a grease designed for corn pickers. It reviews the nature of this market with specific emphasis on the details of the merchandising techniques used. Costs and benefits are summarized.

One of the more unusual aspects of this marketing program is that lubricating grease is given the major emphasis in the overall sales program for a complete line of motor oils and greases. More often marketers highlight their motor oils feeling that grease sales will follow.

The paper traces the evolution of the program over the last 10 years and makes some suggestions for the future in developing the farm market.

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MECHANICAL STABILITY

of Lubricating Grease

By JOHN F. McGROGAN

The Atlantic Refining Company

Mechanical stability is a property of a lubricating grease that must be considered when choosing a grease for a given application. Due to the complex structure of a grease, its mechanical behavior is much more difficult to predict than that of the bodies usually studied in mechanics. Logical questions that should be answered are (a) what mechanical device should be used to evaluate mechanical stability and (b) what limits should be set on consistency change.

In practical application, lubricating grease may be subjected to shear rates varying from a few reciprocal seconds up to a million or more. Rating the mechanical stability of a lubicating grease by a laboratory test run under a fixed set of conditions can be very misleading.

Our objective in discussing this subject is not to define a method for evaluating mechanical stability, but to point out some of the complexities involved so that the grease user may be aware of the limitations of laboratory mechanical stability tests as they exist today.

The following three cases compare laboratory mechanical stability data and field performance.

Case I

The first case involves two modern lubricating greases used as automotive wheelbearing lubricants. Both are water insoluble, have dropping points above 350° F., and are conventional with respect to mineral oils and oxidation inhibitors. Grease A performed well in the wheelbearings of passenger cars and trucks. In the same service grease B caused some trouble. The bearings either failed or required frequent lubrication because the grease did not adhere to the rollers or raceways in spite of an abundance of grease in the immediate area.

While many factors are involved when considering lubrication, reaction of the grease in shear may explain the experience just mentioned. In the past, we have observed that greases incompletely milled can sometimes stiffen up in regions of high shear (areas of contact in ball or roller bearings) sufficiently to cause the grease to change structure and not wet the surfaces. Can this be detected before field testing, or before extensive damage takes place in use? From a purely mechanical standpoint the following laboratory shear data may be of interest.

	Grease A (Good in Service)	*Grease B (Poor in Service)*
Change in ASTM pen. in High Pressure Homogenizer (shear rate over 1,000,000 sec.$^{-1}$)		
40 microseconds exposure	—5	—13
additional 40 microseconds	—2	—2
additional 40 microseconds	—3	—5
Change in ASTM pen. in Shell Roller Test @ 160 rpm		
at room temp. in 4 hrs.	+20	+10
Change in ASTM pen. after laboratory Kettle Stirring (shear rate about 20 sec.$^{-1}$)		
2 hours	+69	—25
7 hours	+76	—42
ASTM Worker (60 strokes/min.) (shear rate varies from 0 to approx. 400 sec.$^{-1}$)		
0 strokes	260 pen.	281
60	274	287
1,000	285	290
10,000	299	286
20,000	300	271
55,000	292	260

It will be noted that under the influence of the high shear rate in the homogenizer the greases both stiffened slightly. In the Shell Roller Test, grease A softened slightly more than B, but both would be classed as stable. Under the very low shear rate obtained by kettle stirring, grease A softened considerably, while grease B *stiffened* to a large extent. With extended working in the ASTM grease worker, grease A softened slightly to a constant consistency. Grease B, on the other hand, softened slightly at first but, with further working, became significantly stiffer.

In field tests, bearings lubricated with grease B had very little grease on the rollers and raceways, yet there was plenty of grease on the separators between the rollers. Except for a slight stiffening, this grease was in its original condition. The grease between the rollers of bearings lubricated with grease A fed the rollers and races, keeping them lubricated. In this case the grease that softened to a limited extent gave better field service than one that became stiffer. The low shear rate laboratory kettle stirring test predicted this best, with the extended ASTM worker data also predicting the same performance, but to a lesser degree.

Case II

Another field experience involving change of consistency with extended working is of interest. This problem involved pumping the grease from a central reservoir through long feeder lines to large, heavily loaded, cast iron bearings. Conventional greases soft enough to pump

readily through the lines were too soft to stay in the bearings. A grease was tailored for this application which pumped very readily and also had good retention in the bearings. This tailored grease had a unique structure that gave it abnormally high pumpability for a given consistency. This structure also gave a peculiar worked stability curve, as shown in the following table:

	Conventional Grease	*Tailored Grease*
ASTM Worker (60 strokes/min.)		
0 strokes	230 pen.	262
60	300	288
500	310	285
1,000	320	278
5,000	325	260
10,000	326	268
Roller Test—		
equilibrium ASTM pen.	358	335
Relative Pumping Rates (85° *F.*)	1	6

In this particular application the grease that stiffened on working in the ASTM worker performed better. This is the reverse of the choice in Case I.

Case III

Two greases with the same oil and the same general type of soap were tested in heavy duty trucks, and both performed well.

In the Shell Roller test, one grease softened to a much greater degree than the other. In fact, on the basis of this test it might be considered unsatisfactory, which is contrary to field performance. These two greases were also compared under two other types of shear; (a) stirring in a laboratory kettle, and (b) passing the grease through capillaries in the ASTM viscosity apparatus. These tests showed practically no difference in consistency change in the two greases.

	Grease No. 1	*Grease No. 2*
Change in ASTM pen. in *Shell Roller Test*		
(160 rpm @ room temp. for 4 hrs.)	+130	+7
Change in ASTM pen. in *Kettle Stirring*		
(approx. shear rate = 20 sec.$^{-1}$)		
2 hours	+20	+25
7 hours	+34	+35
Change in ASTM pen. in passing through *Apparent Viscosity Capillaries*		
Shear rate =		
16.2 sec.$^{-1}$; exposure 21 sec.	+7	0
540 sec.$^{-1}$; exposure 0.7 sec.	+7	−3
8677 sec.$^{-1}$; exposure 0.03 sec.	+7	+3

Other factors may affect the mechanical stability of lubricating greases under operating conditions. Water or air picked up by the grease in service may change its consistency.

Water can have quite different effects on various greases. Two comparable sodium greases were tested by adding water in small increments to the grease in an ASTM worker and working 500 strokes. One grease was slightly stiffer at a 50-50 grease-water mixture than it had been originally. On the other hand, the second sodium grease became exceedingly soft when the mixture was only 60% grease and 40% water.

Aeration of a lubricating grease may have a marked softening effect. Due to differences in design and operating conditions, a grease might aerate in the practical application, but not in a laboratory test. As an extreme case of the effect of aeration under shear, we have run a ball bearing filled with aluminum grease both in a vacuum and in air. In a vacuum, the grease retained its structure and color. When air was permitted to enter the chamber, the grease quickly picked up air, making it fluid enough to run out of the bearing.

Another factor may be considered in developing future laboratory tests. Most laboratory tests for mechanical stability by design expose all of the grease to the mechanical force. In practice, however, most of the grease does not remain in contact with the lubricated surfaces but is pushed aside. Some greases will tend to flow back, others will not. In fact, some greases may channel to such an extent that lubrication of the moving elements will be inadequate.

It appears to us that mechanical stability is an important characteristic of lubricating greases and should receive considerable study. During the initial phases, these studies should include factors such as shear rate, time of exposure to shear, operating temperature and inclusion of water and air.

Patents and Developments

Calcium Mixed Base Greases

All-purpose lubricating grease compositions having outstanding structural stability and high temperature performance, and thickened with a complex of calcium soap and a barium, strontium or magnesium soap prepared in a sequence of specific processing steps, is described in U. S. Patent 2,708,659 issued to Esso Research and Engineering Company.

The high temperature properties of calcium greases are very poor, due to the necessity of incorporating water with the calcium soaps during manufacture of the greases. At temperatures above about 200° F., the water of formulation is driven off and the grease structure breaks down.

Although a mineral lubricating oil, such as a conventionally refined distillate, is preferred for the preparation of the improved greases, a synthetic oil may also be utilized as the dispersing agent. Although a synthetic lubricant of the ester type, for example, the esters of dibasic acids and long chain alcohols, is a preferred type, other well known synthetic lubricants may be used. Complex esters made from dibasic acids, glycols, and alcohols may be used as may the polymerized glycol esters, glycol

ethers, polymerized olefins, alkylated aromatics, polymerized silicones, formals, mercaptals, and the like. The only prerequisite is that the dispersant chosen be one that will furnish the desired lubrication when utilized as a grease composition.

The acid used to form the soaps that are used in formulating the greases may be any of the high molecular weight fatty acids commonly used in grease making. Such fatty acids as the hydrogenated fish oil acids, stearic acid, oleic acid, hydroxy acids, tallow, any of the generally known fatty acids glycerides or mixtures of these in any proportions may be used. The acids prepared by the "Oxo" process having from 10 to 30 carbon atoms may also be used. Of the high molecular weight fatty acids, use of the hydrogenated fish oil acids is preferred.

As was stated above, the thickening agent used in formulating these new and improved greases is a mixture of calcium soap and a soap of a metal selected from the group consisting of barium, strontium and magnesium. The calcium soap must be present in amounts ranging from about 2.5% to about 15.0% by weight, based on the weight of the finished composition. The amount of the soap of the other metal used is such that the molar ratio of the calcium soap to the second metal soap is preferably within the range of the 2:1 to 1:2. The amount of the combined soaps present will depend somewhat upon the desired final consistency of the product. Ordinary usage would call for a grease composition according to the instant invention containing from about 5% to 30.0% by weight of combined soap, with a range of from 10.0% to 20.0% of soap being especially preferred.

In addition to the two critical limitations outlined above, that is, use of a combination of calcium soap with limited amounts of a barium, strontium, or magnesium soap of a high molecular weight substantially saturated fatty acid as the thickener, there are two other process limitations which must be met in preparing the grease compositions of this invention. It is an essential feature in the preparation of these grease formulations that the calcium soap be dispersed in the lubricating oil base before the other metal soap is added and dispersed. The exact reason for this phenomenon is not known, but it is believed that the calcium soap increases the solubility and hence improves the degree of dispersion of the other metal soap in the oil and thus increases the yield as well as the structural stability of the finished product.

The second critical feature in the method of formulation is that the total mixture of oil and soap must be heated to a temperature above about 350° F. after dehydration. It is believed that a phase transition of the soap mixture occurs at or above 350° F. producing a new arrangement of the soap molecules that is stable both at low and elevated temperatures, i.e. it does not reverse to the original phase upon cooling. Only those greases that are so treated show the heat stability characteristics that are desired, together with the well known excellent lubricating properties of the heat unstable straight cal-

cium greases.

In order more clearly to illustrate the patented process, the following example is given.

In accordance with the concepts of the instant invention but without heating above 350° F. the following grease composition was prepared by the procedure given below:

Formulation

17.00% hydrogenated fish oil acids (Sap. No. 195)
0.88% calcium hydroxide
5.63% barium hydroxide octahydrate
76.49% mineral oil distillate (70 SUS/210° F.)

The total charge of the fish oil acids, and one third of the mineral oil were mixed and heated until a homogeneous solution was obtained. An oil slurry of calcium hydroxide was added and the temperature was allowed to rise to 210° F. When the reaction and the subsequent evolution of water vapor had stopped, dry barium hydroxide octahydrate was added to the mixture and the temperature allowed to reach 240-250° F. After complete dehydration the soap mixture was cut back with the remaining mineral oil while the temperature was brought up to about 300° F. When all the oil was added, the mixture was removed from the heating medium and allowed to cool without stirring.

This grease having a Ca-Ba mole ratio of 1:1.5 and a soap content of 17%, exhibited the following properties:

Dropping Point (° F.) 332
Water Solubility (30 min./210° F.) ..... None
Micro-Penetration: (mm./10 @ 77° F.)
Worked (10 strokes, 60 mesh screen)
Initial 58
Worked after 400 hrs. @ 250° F. 43

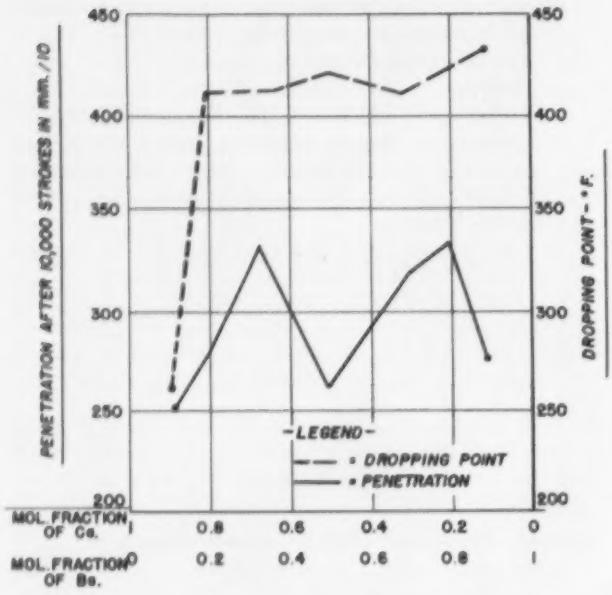
It will be noted that the dropping point is almost double that of a straight calcium base grease and, on heating to 250° F. for 400 hrs., the straight calcium grease almost doubles in hardness.

As can be seen from the accompanying figure, any amount of barium soap added to a calcium soap will improve high temperature qualities and structure stability. Although small amounts of barium soap will cause substantial improvement, the most marked improvement is when the mole ratio of calcium to barium is less than 8:1, i.e., 4:1 or 2:1, etc.

Since changes from acidic to alkaline reacting grease compositions do not affect appreciably the finished product, this fact adds to the desirability of using such compositions.

Greases Thickened with Phenylene Diamides

Since metal soaps are pro-oxidants, it has been the custom to incorporate fairly large amounts of anti-oxidants to counteract this effect. In U. S. Patent 2,709,157, issued to California Research Corporation, phenylene diamide-thickened greases are described which are claimed to be more resistant to oxidation and to have increased melting points, and they do not lose their thickening ac-



tion as rapidly as soap-thickened greases.

The grease compositions of this patent comprise mainly oils of lubricating viscosity and acyl derivatives of phenylene diamines.

As used herein, the term "acyl derivatives of phenylene diamines" means (1) phenylene diamines containing two acyl radicals, one acyl radical being attached to each of the nitrogen atoms, (2) phenylene diamines containing one acyl radical and one aliphatic radical, that is, phenylene diamines containing one acyl radical attached to a nitrogen atom and an aliphatic radical attached to the other nitrogen atom, and (3) phenylene diamines containing one acyl radical attached to one nitrogen atom, leaving one amino group as such, that is, the acyl derivative of phenylene diamine will have one acyl radical attached to one nitrogen atom, and two hydrogen atoms attached to the other nitrogen atom. Because of their stability to oxidation and their effectiveness as thickening agents, the phenylene diamines containing two acyl radicals, one acyl radical being attached to each of the nitrogen atoms, are the preferred acyl derivatives of phenylene diamines for the purposes of this invention. Furthermore, it is preferred that the nitrogen atoms of the phenylenes diamines be in the para position to each other. However, the ortho and meta acyl derivatives of phenylene diamines also function as thickening agents in lubricating oils according to this invention.

The acyl derivatives of phenylene diamines of this invention contain a total of from 18 to 30 carbon atoms, 18 to 24 carbon atoms being preferred. That is, in addition to the 6 carbon atoms of the phenylene nucleus, the acyl derivatives of phenylene diamines contain from 12 to 24 carbon atoms, 12 to 18 being preferred.

As used herein, the term "aliphatic radicals" means those radicals which are composed mainly of hydrogen and carbon, and include such radicals which contain, in addition, minor amounts of substituents, such as oxygen, nitrogen, etc.

Examples of acyl radicals include those derived from the following fatty acids: formic acid, acetic acid, propionic acid, butanoic acid, caproic acid, caprylic acid, capric acid, lauric acid, tridecanoic acid, myristic acid, palmitic acid, stearic acid, arachidic acid, mixture of fish oil fatty acids, etc.

Examples of aliphatic radicals include the radicals derived from methane, ethane, ethene, propane, propene, butane, butene, pentane, hexane, isohexane, heptane, isoheptane, octane, isooctane, decane, dodecane, tetradecane, hexadecane, octadecane, isosane, docosane, etc.

Examples of acyl derivatives of phenylene diamines which can be used according to this invention to thicken lubricating oil compositions to the consistency of a grease include the ortho, meta and para isomers of the following: N-formyl-N′-stearoyl phenylene diamine, N-acetyl-N′-stearoyl phenylene diamine, N, N′-dilauroyl phenylene diamine, N-valeryl-N′-caprylyl phenylene diamine, N-acetyl-N′-capryl phenylene diamine, N-butyryl-N′-arachidyl phenylene diamine, N, N′-dicaprylyl phenylene diamine, N, N′-dicapryl phenylene diamine, N-acetyl-N′-oleoyl phenylene diamine, N-acetyl-N′-stearoyl phenylene diamine, N-butyryl-N′-lauryl phenylene diamine, etc.

The following is an example of a grease prepared according to this patent:

A mixture of 10 grams of N-acetyl-N′-stearoyl-p-phenylene diamine and 30 grams of a California solvent-refined paraffin base oil having a viscosity of 450 SSU at 210° F. was heated, with agitation, to 340° F., then cooled to room temperature.

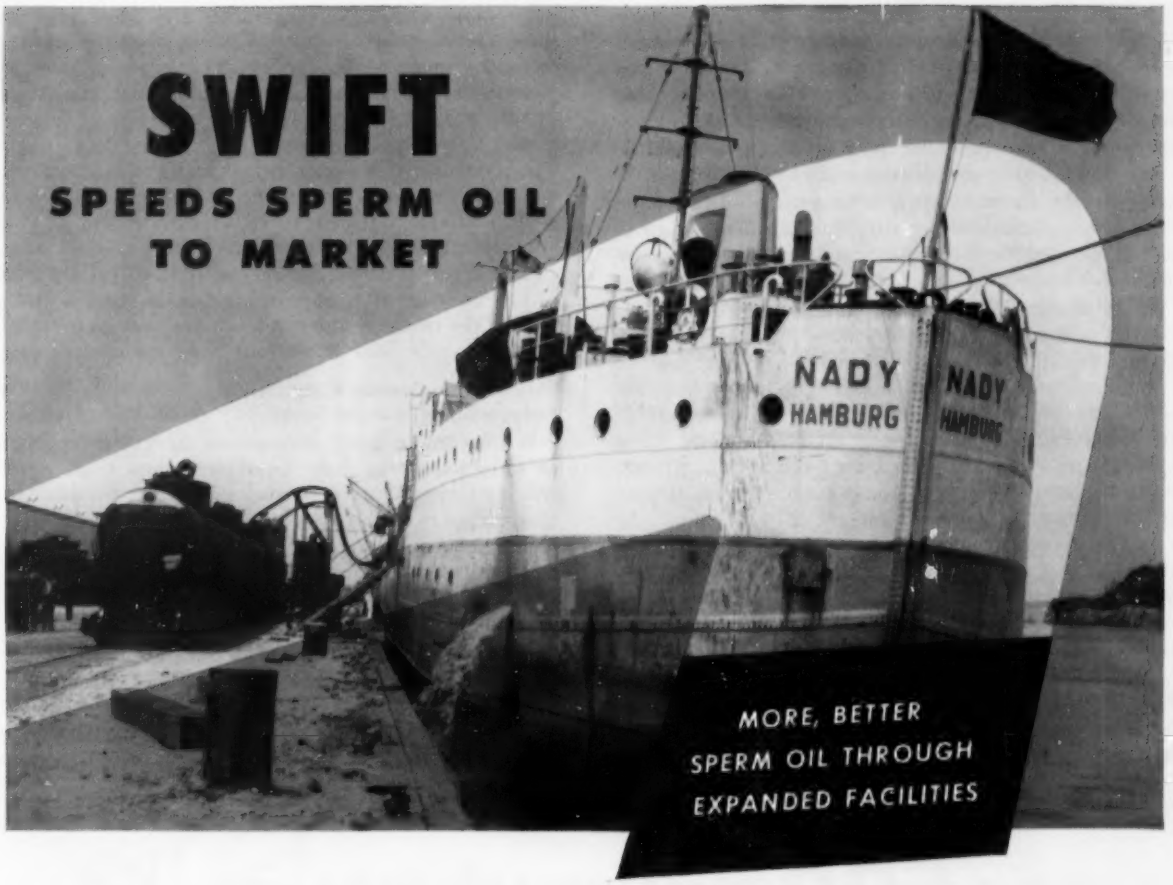
The resulting grease composition was unctious and had a melting point of 320° F.

Bentonite-Soap-Thickened Lubricants

A dispersion of a metallic soap and a compound of bentonite and an organic base in an oil has been found, according to U. S. Patent 2,710,837 issued to Gulf Research & Development Company, to result in a lubricant having improved anti-rust characteristics and good mechanical and lubricating properties over a wide temperature range.

The soaps which can be employed in the compositions of the patent include the metallic soaps of the fatty acids, such as the aluminum, zinc, magnesium, lead, calcium, sodium, barium, lithium and strontium soaps of stearic, palmitic, oleic, linoleic acids, and the like. In general, the soap content comprises between about 2 and about 10 per cent by weight of the total composition. The amount of soap employed in any particular instance is sufficient to substantially inhibit the rusting of metal surfaces in contact with the lubricant. The weight ratio of soap to the bentonite compound may vary over wide limits. The ratio of soap to bentonite will change depending upon the amount of soap required to obtain the desired antirust characteristic.

The bentonite compounds employed are compounds composed of a montmorillonite mineral in which at least a part of the cation content of the mineral has been replaced by an organic base. Clays that swell at least to some extent on being contacted with water and contain as a primary constituent a mineral of the group known



● Typical of Swift's efforts to improve and expand our production of quality sperm oil is receipt of this shipment of Norwegian oil—literally delivered to our back door!

This ship, of German registry, recently discharged the first shipment of Norwegian sperm oil to be routed via the St. Lawrence waterway—to Swift's Chicago terminal facilities at the Calumet harbor.

Combined with Swift's modern and expanded crystallization facilities at Hammond, Indiana, and Harrison, New Jersey; improvements in the handling of raw materials have contributed strongly to the increased availability, improved quality and excellent uniformity of Swift's Sperm Oil. If you've been "making do" with an inferior substitute for the real marine product, write for a sample of Swift's Sperm Oil. Take advantage of the *real* advantage offered by our expanded facilities and remember . . .

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as montmorillonites are generally referred to as bentonites. Such clays, which contain exchangeable alkali metal atoms either naturally or after treatment, constitute the raw materials employed in making the bentonite-organic base compounds used in the compositions of this invention. So far as known, all naturally occurring montmorillonites contain some magnesium and certain of them, as exemplified by Hector clay, contain such a high percentage of magnesium that they largely have magnesium in place of the aluminum content characteristic of the more typical montmorillonites.

The bentonite-organic base compounds are preferably prepared as described in U. S. Patent No. 2,033,856, by bringing together the bentonite and the organic base in the presence of aqueous mineral acid to effect base exchange. The organic bases should preferably be titratable with mineral acids. Among these reactive bases are many alkaloids, and cyclic, aliphatic, and heterocyclic amines. The bentonite-organic base compounds used in preparing the lubricating compositions of this invention are preferably those prepared by bringing together a bentonite clay and such organic bases as aliphatic amines, their salts, and quaternary ammonium salts. Examples of such amines and salts are: decylamine, dodecylamine, tetradecylamine, hexadecylamine, octadecylamine, hexadecyl ammonium acetate, octadecyl ammonium acetate, dimethyldioctyl ammonium acetate, dimethyldicetyl ammonium acetate, dimethylhexadecyloctadecyl ammonium acetate, and the corresponding chlorides and quaternary ammonium chlorides. The organic bases employed should be such as to impart substantial organophilic properties to the resulting compounds. The preferred bentonite compounds are prepared from quaternary ammonium compounds in which the N-substituents are aliphatic groups containing at least one alkyl group with a total of at least 10 to 12 carbon atoms. When aliphatic amines are used they preferably contain at least one alkyl group containing at least 10 to 12 carbon atoms.

The amount of bentonite compound used is preferably in the order of about 3 to 10 per cent by weight.

Performance data on various combinations are given.

Thixotropic Grease Containing Polycarboxylic Acid Soap

A thixotropic lubricating grease having the property of softening or partially liquefying upon working and quickly reverting to its normal solid structure thereafter, is described in the Esso Research & Engineering Company patent 2,710,838. In some cases, the bearings, housings or other operating parts to be lubricated cannot be made sufficiently liquid tight to prevent undue loss of liquid lubricant. Greases are used in such cases.

In some types of lubrication, however, it is desirable to have a certain degree of fluidity even in the lubricating grease. If a lubricant is too firm and channels too

completely, the operating parts may be starved for lubricant. On the other hand, it may not be possible to employ a completely liquid substance, so that a compromise is often necessary.

The patent discloses use of a soap of polybasic acids having a molecular weight preferably over 250 and up to about 3000, such as VR-1 sold by Rohm & Haas Company, which has a molecular weight of about 1000.

The following is an example of the preparation of a grease according to the patent:

	Per Cent
"VR-1" acid (Rohm and Haas, mol. wt. about 1000)	11.0
NaOH	1.3
Phenyl alpha naphthylamine	0.5
Mineral oil of about 45 S.S.U. viscosity at 210° F.	87.2

Preparation

The "VR-1" acid and about one-third of the mineral oil were mixed together and heated while stirring to about 150° F. A 25% aqueous solution of sodium hydroxide was then added and the resulting soap concentrate was dehydrated at 225-250° F. The balance of the mineral oil was then added and the mixture heated until it melted at about 380° F. The inhibitor was then added and the heat was discontinued, the product being allowed to cool. On cooling a smooth, transparent, solid grease resulted. It was homogenized to a smooth unctuous product.

Properties

Penetration @ 77° F., mm./10:
- Unworked .....175.
- Worked 60 strokes .....180.
- Worked 100,000 strokes ..202 (after standing one hour after working).

Dropping point, ° F.....325.

On working this grease the product became semi-fluid but it did not completely lose its solid body. On standing without working, the grease quickly recovered its original solid structure and consistency.

The above thixotropic property can be governed or controlled by the combined soap of a mixed high molecular weight acid and a typical high molecular weight acid of conventional type such as stearic or "Hydrofol Acid 51" or "54" (saturated acids of about C_{18} average chain length, obtained by hydrogenating fish oil acids).

Aryl-Urea Thickened Greases

Novel greases thickened with certain high melting aromatic ureido and amido compounds are disclosed in U. S. Patent 2,710,839 issued to Standard Oil Company, (Indiana). Greases of this type, particularly those wherein the vehicle is a silicone polymer oil, are claimed to have demonstrated exceptional stability and lubricity at elevated temperatures.

According to this patent, the progress of thickener research has not, in general, kept pace with the development of lubricant vehicles. And, at temperatures as high as 400°-450° F., there are few if any greases available

NLGI Associate and Technical Men

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Representative—M. E. Wight

REFINERS

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Representative—J. W. Basore

Valvoline Oil Company
Division of Ashland Oil & Refining Co. Box G
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Mallinckrodt Chemical Works
2nd & Mallinckrodt Sts., St. Louis 7, Missouri
Representative—C. E. Cosby

N. I. Malmstrom & Company
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Representative—Ivar Wm. Malmstrom

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165th & Indianapolis Blvd., Hammond, Ind.
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Representative—C. F. Williams

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Les Laboratoires de Recherches Purfina
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Midwest Research Institute
425 Volker, Kansas City 10, Missouri
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Phoenix Chemical Laboratory, Inc.
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Products Development Laboratory
1 Market St.
West Warwick, Rhode Island

Sociedad Nacional de Petroleos
Rua D. Pedro V, no. 80, Lisbon, Portugal
Representative—Manuel Corda Boullosa

which will retain their consistency and lubricity for any substantial period of time. Silicone and fluorocarbon vehicles are available for high temperature use, but, unless a thickener having the same degree of thermal stability is available, they are of little use for greases.

The patent states that now it has been found that certain very high melting aromatic ureas, di-ureas, amides and di-amides, containing at least one RNH"-radical, may be employed to thicken silicone polymer oils and other known vehicles. R is an aryl radical, and the compounds may be referred to as urylcarbamyl compounds. Thus it is possible to produce greases of particular utility between 250°-400° F.

Examples of various ureas and di-ureas which have been found useful as thickeners in accordance herewith are p-carboxy-1, 3-diphenylurea; p-chloro-1, 3-diphenylurea; 1, 3-di-(1-naphthyl)-urea; 4, 4'-bis-[3-(p-biphenylyl)-ureido]-biphenyl; 1-(p-carboxyphenyl)-3-(p-biphenylyl)-urea; 1-(p-carboxyphenyl)-3-(o-biphenylyl)-urea; 1, 3-di-(p-biphenylyl)-urea; 1, 3-di-(o-biphenylyl)-urea; 4, 4'-bis-(3-phenylureido)-3, 3'-dimenthoxy biphenyl; p-phenylure-than-1, 3-diphenyl-urea; p-cyano-1, 3-diphenyl-urea; 1-(2, 5-dichlorophenyl)-3-phenyl-urea; 4, 4'-bis-[3-(2, 5-dichlorophenyl)-ureido]-biphenyl; 1, 4-bis-[3-(2-chlorophenyl)-ureido]-benzene; 1, 4-bis-[3-(-chlorophenyl)-ureido-]-benzene; 1, 3-bis-[3-(3-chlorophenyl)-ureido]-benzene, and 1, 3-bis-[3-(2-chlorophenyl)-ureido]-benzene. Compounds of this type may readily be prepared by reacting an amine or diamine such as aniline, benzidine, phenylene-diamine, etc.

Data are presented wherein other vehicles besides silicone polymer oil, such as Ucon 818, di-2-ethyl hexyl sebacate, tricresyl phosphate, benzyl benzoate, A.T.F. extracted oil and fluorocarbon oil are thickened with p-carboxyl-1, 3-diphenyl urea and 4, 4'-bis (3-phenylureido)-biphenyl.

In U. S. Patent 2,710,840 issued to the same company, greases containing thickeners such as 1, 4-bis (3-phenylureido)-benzene are described while in patent 2,710,841 aryl substituted urea thickeners are produced from p-tolyl isocyanate, p-phenylene diamine and benzidine. The following is an example of the preparation of a grease according to the latter patent:

A five-gallon double-action scraper kettle was charged with 2000 grams of D. C. 550 Silicone Fluid (phenylmethylpolysiloxane product of Dow Corning more fully defined hereinabove), 160 grams of p-chlorophenyl isocyanate, and 204 grams of p-biphenylyl isocyanate. The mixture was heated to 150° F. to melt the p-biphenylyl isocyanate.

To the above stirred mixture, 184 grams of benzidine dissolved in about 2 liters of 2-butanone was added over a period of 20 minutes.

The remainder of the silicone oil, 1000 grams, was then added and the solvent was boiled off and the resulting grease was heated with stirring for 4 hours at 420° F. After the grease was cooled to room temperature, it was passed through a colloid mill to complete the preparation. The finished grease had an ASTM penetration of 318 (unworked) (Kaufmann micropenetration of 132), 338 after 60 strokes, and 354 after 100,000 strokes. An A.B.E.C.-N.L.G.I. bearing test (hereinafter described) employing this grease at 450° F. and 10,000 R.P.M. ran for 553 hours.

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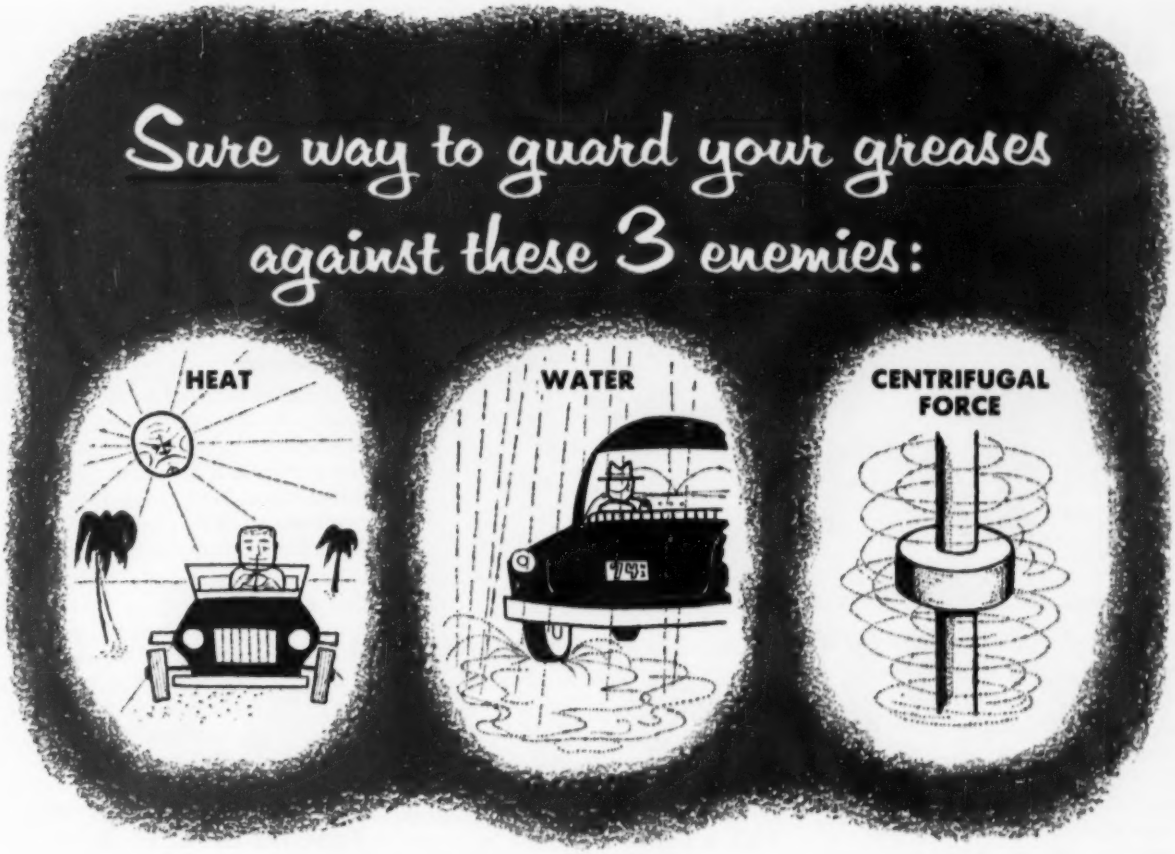

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PEOPLE in the Industry

Founder and Past President of Nopco C. P. Gulick Dies

Charles P. Gulick, Honorary Chairman of the Board of the Nopco Chemical Company died September 4th at Dover General Hospital after a brief illness. He was in his 70th year.

One of the founders of Nopco, Mr. Gulick served as president of the company from 1932 to 1938, Chairman of the Board from 1938 to 1940, and served in both posts from 1940 to 1949. He was Chairman of the Board from 1949 to 1954, after which he held the position of Honorary Chairman of the Board.

When he helped found the company in 1907, Nopco's assets consisted of a few wooden vats, a couple of paddles, and a few hundred dollars in cash. Operating out of a rented basement in Newark, N. J., its line consisted of a single product.

Today Nopco is a leading manufacturer of synthetic organic chemicals for industry with thousands of products, and with several plants in the United States and Canada. The first to manufacture vitamins A and D in concentrated form, Nopco introduced vitamin D to the dairy industry.

Mr. Gulick was a past president of the Rotary Club of Newark, N. J., and a member of the Masonic Order, the Newark Athletic Club, and the Essex Fells Country Club. He served as a member of the Board of Trustees of East Orange General Hospital.

Southwest Grease & Oil Announces Appointment Of J. R. Hodges

J. R. Hodges is the newly appointed Southeastern sales territory representative for the Southwest Grease & Oil Co., Inc. of Wichita, Kansas. After extended experience in the industry as a major oil company representative Mr. Hodges has recently joined Southwest, and is now completing a training schedule within the plant and offices.

Rheem Appoints Mallatratt

Gordon W. Mallatratt, general manager of the Rheem Products Division, has been named a vice president of the Rheem Manufacturing Company. His election was announced today by President R. S. Rheem following a meeting of the board of directors.

The new vice president has been a member of Rheem's top management team since 1951, when he was appointed general attorney for the organization. Mallatratt served in that capacity until last year, when he was named general manager of the Rheem products division. While serving as general attorney he also functioned as comptroller and secretary.

Mallatratt received his B.A. degree from Stanford in 1935 and his Master of Business Administration in 1937.

The Rheem Products Division manufactures steel and fibre containers, water heaters and water softeners, air conditioning equipment, heating units, and boilers and tanks. Rheem Manufacturing Company, operating through 14 domestic plants and 17 overseas plants, produces a wide range of products for the home, industry and the military.

Gross Names Lechner Distributor

Carl A. Lechner Co., 6560 Sheridan Road, Chicago 26, Ill., has been named distributor in the Chicago territory for A. Gross & Company, 295 Madison Avenue, New York 17, N. Y., it was announced by Eugene W. Adams, Vice President of Gross.

Lechner will handle the complete line of Fatty Acids and Glycerides manufactured by the 118-year-old Gross organization at Newark, N. J.

This brings to 32 the number of Gross distributors located in principal cities throughout the United States, Canada, and Mexico.

Continental Can Company Appoints Dr. R. M. Brick

Dr. Robert M. Brick, former director of the school of metallurgical engineering at the University of Pennsylvania, has been named director of the department of metallurgy of Continental Can Company's Central Research and Engineering Division.

Dr. Brick is a consultant to the Frankfort Arsenal of the U. S. Army and to the Atomic Energy Commission's installations. He is a former consultant to the Oak Ridge National Laboratory.

His academic career has included membership on the faculty of Yale University. He also is the author of a widely-used college textbook on metallurgy and over 30 scientific papers. One of these, published in 1937, received the American Institute of Mechanical Engineers' award as the outstanding research paper published during that year in the organization's journal.

Dr. Brick is a member of the Ship Steel Committee of the National Research Council, and of the Metals Division, A.I.M.E. He also is an active participant in the work of several other metal and engineering societies.

Industry NEWS

DuPont Equips Lincoln Fuel Test Car With New Distribution Method

Fuel injection passenger cars were previewed here today in a Lincoln fuel test car equipped by the Petroleum Chemicals Division of the Du Pont Company. The American Bosch fuel system installed in the Lincoln by Du Pont automotive engineers is one of the first systems of its kind to be used in a passenger car. This system, which may soon be offered in some of the higher priced automobiles, provides metered and identical amounts of fuels to each of the cylinders at timed intervals.

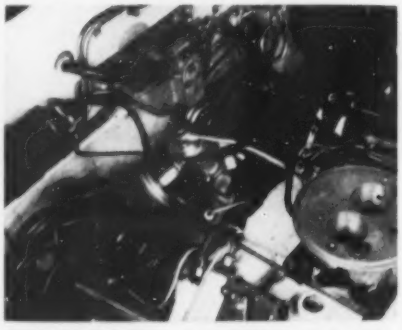
Among the advantages of the system, as proved in Du Pont tests, are the lowering of octane requirements of the engine and the fact that fuels with higher volatility and higher end point may be used. At the same time, vapor locking tendencies are decreased, permitting the use of higher volatility fuels. From the standpoint of styling, elimination of the carburetor will enable designers to lower hoodlines.

Provided by Du Pont to show refiners some long-term effects this new fuel distribution method may have on the refining industry, this automobile has been used by the company to gather data during the past several months. These data have been correlated by Du Pont's refinery technologists to show how certain fractions from the crude may be upgraded to raise both end point and volatility and to provide increased profits.

The Du Pont tests on the company's modern chassis dynamometer at the Petroleum Laboratory at Deepwater Point, N. J., proved most of the other claims which have been made for fuel injection. They demonstrated, for instance, that fuel injection could result in lowering the octane requirement of an engine by as many as five numbers. This lower octane demand results from the engine running cooler.

The relative freedom from vapor lock was demonstrated by using a critical vapor lock procedure on the chassis dynamometer. This test included high speed driving followed by a "heat soak" period and it was found that a fuel injection engine can tolerate a Reid vapor pressure fuel at least five pounds higher than a carbureted engine.

The Du Pont engineer shown here is using an air-fuel analyzer in conjunction with test work in Du Pont's fuel injection Lincoln. System has been used in extensive tests to determine what long-term effects fuel injection will have on the refining industry.



The fuel injection pump, the heart of the fuel injection system. Pump sends a metered amount of fuel at timed intervals through the fuel lines into each of the combustion chambers.

The mechanical components of this new fuel system consist of a pump to transfer fuel from the pressurized tank at about 35-pounds per square inch through a filter to the fuel injection metering pump. The injection pump then distributes the required amount of fuel to each of the eight fuel nozzles in the intake ports where the fuel is sprayed into the air stream.

Multi-Million Dollar Plant Begun for Du Pont's Electrochemicals Department

Plans for a multi-million dollar addition to the new Du Pont plant now under construction near Antioch, Calif., were announced today by the company.

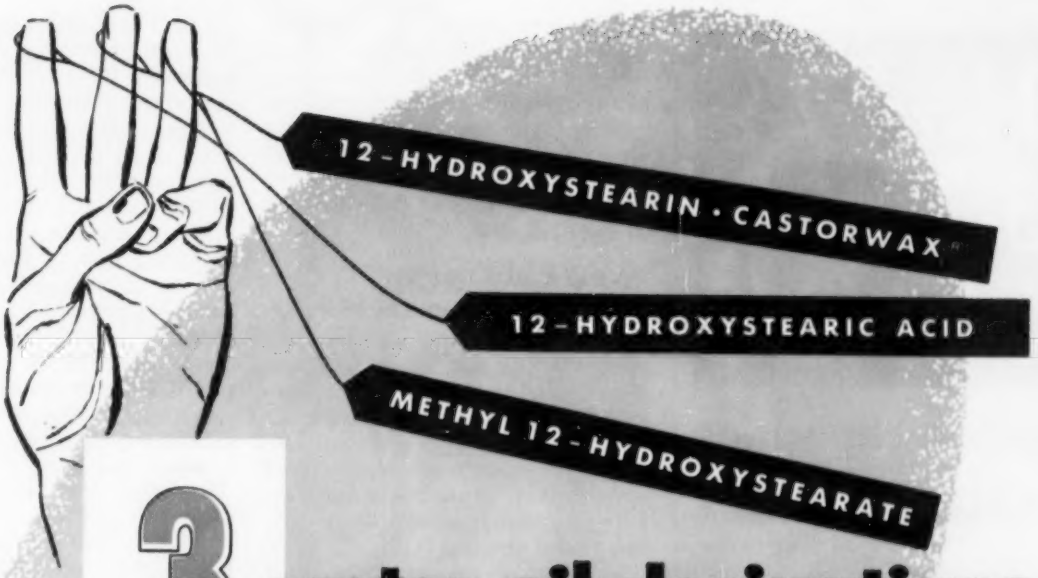
The new unit, to be operated by Du Pont's Electrochemicals Department, will manufacture sodium, ethyl chloride, trichlorethylene, and perchlorethylene. It will adjoin and be integrated with the tetraethyl lead and "Freon" refrigerants plant which is scheduled for completion late in 1956. Sodium and ethyl chloride are essential ingredients in the manufacture of tetraethyl lead. Trichlorethylene and perchlorethylene are solvents widely used in industry.

The expansion will occupy a part of the previously acquired site located two miles east of Antioch on the San Joaquin River. It will provide production jobs for some 250 people, thereby increasing to 500 the number of employees who will be needed to operate the entire plant when it is completed. The majority of these people will be hired locally.

According to present schedules, the new addition is expected to be completed during the early part of 1957. It will be designed and constructed by the Du Pont Engineering Department.

In addition to supplying intermediates for tetraethyl lead, the newly announced plant unit will also manufacture metallic sodium for sale to Du Pont customers on the West Coast. Sodium is used extensively in metal descaling, especially for stainless steel. The trichlorethylene manufactured at the plant will go chiefly to the West Coast aircraft and metal fabricating industries for use in degreasing metal parts. Principal consumer of perchlorethylene will be the dry cleaning industry.

Du Pont has been a major producer of sodium, trichlorethylene, and perchlorethylene for many years and until now has shipped them to customers from plants located in the East and Middle West. With the rapid expansion of industrial use on the West Coast, there is now a need for facilities to manufacture these products close to their points of consumption. The establishment of a West Coast plant will enable Du Pont to give its customers better service by providing them with quicker deliveries and an additional source of supply.



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The three primary raw materials needed by the plant, electricity, propane, and salt, will all be purchased locally. Propane, produced from petroleum, will be brought into the plant from nearby refineries. Salt will come from the San Francisco Bay area where it is extracted from sea water by solar evaporation.

"Week-End Creation" Produced by General Mills

The amazing new device which mechanically blended a bicycle wheel, alarm clocks and razor blades to successfully drop millions of anti-Communistic leaflets from giant balloons behind the Iron Curtain was invented and produced in the Minneapolis engineering laboratories of General Mills Mechanical Division.

The story of a "weekend creation" by two Minneapolis engineers which enabled General Mills to fill a rush request from Free Europe Committee, Inc. within 72 hours was uncovered here following the announcement from Germany that large quantities of propaganda have been delivered with amazing success through this new technique.

Several hundred of these unusual balloon units have crossed the Iron Curtain this summer, all of them produced here by General Mills and delivered by the Minneapolis firm to the German launching sites.

Paul Yost and John Macgowan, the two General Mills engineers who developed the device capable of dropping 450 pounds of pamphlets, sometimes totalling 10,000, on a given target, performed the initial launchings in Germany.

The leaflet carrying device, attached to each 34 foot plastic balloon, has the appearance of a bicycle wheel. Each 9-pound packet of leaflets is suspended from a cord attached to the rim at regularly spaced points. An alarm clock initiates two slowly moving motor-powered razor blades around the rim of the wheel, cutting off cords holding packets of the leaflets at fixed intervals.

"General Mills received the request from Free Europe Committee, Inc. on a Friday, asking if we could supply them with a balloon system capable of meeting their needs," explained Yost.

"John (Macgowan) and I were among those assigned the job of coming up with a leaflet carrying system. We worked steadily over the weekend and we had a working model manufactured by Monday.

General Mills mechanical facilities were taxed to fulfill the immediate order of several hundred units.

"We were able to develop this device so fast because of General Mills' long background in making machinery operate at high altitude," declared Frank B. Jewett, Jr., managing director of engineering research and development for the company. General Mills has been making and flying plastic high altitude balloons and associated equipment since 1947.

Asked how they thought of the razor blade for cutting the leaflets loose, Yost told an interesting story:

"We didn't use razor blades at first. We used a small cannon which exploded the cord loose. We tried that in the original flights from Germany, but word got back to us that the Communists were using our cannon device for counter propaganda. They told residents behind the Iron Curtain that these cannon units were deadly. So we had to come up with something new. On the spot in Germany, we experimented until the razor blade idea clicked. We thought of a razor blade because we didn't have anything else."

The huge propaganda balloons are sent on their missions at an altitude of 25,000 feet.

A radio transmitter is used on some flights to provide altitude and locale information and verify the accuracy of pre-determined dropping of leaflets. As the leaflets are released, the balloon rises and this altitude is transmitted back to the launching engineers.

The flights have been so accurate one large pack of leaflets was pinpointed on a packed stadium.

General Mills Expands Chemical Division

S. D. Andrews, Jr., general manager of the Chemical Division of General Mills, today announced that the company has established five district chemical sales offices.

J. H. Allderdice is in charge of the office located at 80 Broad Street, New York; Melvin S. Herban is in charge of the Detroit office at 8047 Hamilton Avenue; D. E. Terry is in charge of the Kansas City office at 612 West

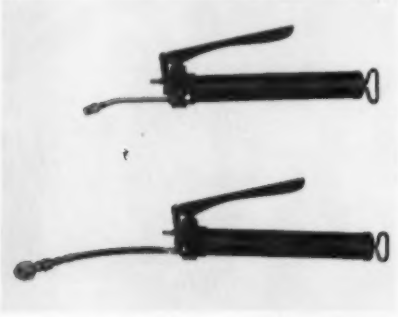
47th Street; and Melvin T. Vincent will handle the Pittsburgh office at 300 Mt. Lebanon Boulevard. The other office will be at 460 South N. W. Highway, Park Ridge (just northwest of Chicago).

The General Sales Office of the Chemical Division will continue to be located at Kankakee, Illinois.

Andrews said these offices, located in key cities and manned by graduate chemists, will expand the Chemical Division's service to customers.

Lincoln Announces New Super Volume Lever-Type Grease Guns

Lincoln Engineering Company announces two new super volume lever guns equipped with rigid Hydraulic Coupler Extension for contacting hydraulic fittings, or with flexible 12" Whip Hose Extension with Button



Head Coupler for contacting button head grease fittings. Manufacturer states these guns will deliver .17 ozs. per stroke, or 6 strokes per oz. using No. 1 Cup Grease at 70° F. Guns may be spring or force primed, hold 21 ounces of lubricant and include filler nipple for fast, clean refilling from a filler pump or by suction. All steel construction, rust-proofed and finished in metallic gun-metal blue. According to the manufacturer, guns develop 2,500 lbs. maximum pressure with ease and are designed especially for servicing bearings requiring large quantities of Lubricant.

More information is available from Lincoln Engineering Company, 5702-30 Natural Bridge Avenue, St. Louis 20, Missouri.

Nopco Plans Construction Of New Pilot Plant

Plans are being made by the Nopco Chemical Company for the construction of a new pilot plant on its property in Harrison. The new structure,

housing the latest in chemical equipment, will be devoted exclusively to developmental work and pilot production of new and improved products. These include Nopco industrial chemicals for use in the paper, textile, tanning, cosmetic, fertilizer, detergent, and many other industries, as well as Nopco vitamin products such as nutritional supplements for poultry and animal feeds, pharmaceuticals, and vitamin fortifiers for milk and dairy products.

The site selected is approximately 10,000 square feet, and is located on the Passaic River front. Although definite plans have not yet been drawn up, a multi-story building is envisaged.

Nopco officials hope to have the building ready for occupancy early in 1956.

British Petroleum Equipment Catalogue 1955-56 Edition

The Council of British Manufacturers of Petroleum Equipment announce the publication of the 1955-56 edition of their composite catalogue of oilfield equipment manufactured in Britain.

This catalogue, published by the Council on behalf of its Members, and now in its fifth edition, has attracted the interest and support of the oil industry and Government authorities alike, since its first appearance in 1947. It is the only publication in England which gives a detailed picture of the British petroleum equipment industry and the wide range of equipment, components, materials and services which it now provides.

The new catalogue—which is the largest to date—consists of 770 pages of closely packed information: 88 pages giving details under classified headings of the equipment manufactured by the Members of the C.B.M.P.E., the remaining pages being catalogue entries compiled by individual Members. The technical data is invaluable to those concerned with the selection of petroleum equipment.

The demand of the oil industry is so extensive, that it calls upon practically every engineering product that is manufactured. The catalogue itself, therefore, although entitled "British Petroleum Equipment," is, in effect, the finest cross-section of the British Engineering industry.

Published price is £2.10.0d. plus postage, and copies are available from the Council's offices at 2, Princes Row, Buckingham Palace Road, London, S.W. 1.

Service Station Training Courses Begin in Virginia High Schools

Service station training courses will be offered to juniors and seniors in 71 Virginia high schools this fall as a result of a coordinated program set up by distributive education officials and Old Dominion oil marketers.

Plans and procedures for the specialized courses were discussed and approved by the educators and oil men at an August meeting on the campus of Virginia Polytechnic Institute here in Blacksburg.

The program will be put into effect as rapidly as possible, with the hope of making Virginia the first state in the nation to implement the course designed by the University of Texas and the American Petroleum Institute's

Division of Marketing. It is being coordinated by the Virginia Oil Jobbers Association and the Virginia Oil Marketers Association, and is being supported also by oil companies large and small.

Among the educators who participated in the planning program were F. B. Cole, director of Vocational Education in Virginia; Miss Louise E. Bernard, state head of Distributive Education; and H. W. Sanders, head of the Vocational Education department at Virginia Polytechnic Institute.

At the Blacksburg meeting of Distributive Education officials, the service station training program was outlined by LeRoy Schneider of Schneider Oil Co., Roanoke, and chairman of the Virginia Distributive Education oil marketers' coordinating committee.

Schneider, who has played a leading role in bringing the Virginia program to a head, explained that five manuals will be used in the classrooms, and that the best of the state's service stations would be utilized for supplemental on-the-job training.

He pointed out that the manuals were prepared by the University of Texas with the cooperation and assistance of the American Petroleum Institute's Marketing Division. Reference materials used in preparation of the manuals were supplied by nearly 100 companies. The manuals cover every phase of service station operation, and include 76 lesson assignments.

After the students have graduated, Schneider said, they can become full-time employees of dealers, or they may take a station of their own. The most significant part, however, is that they are already trained for their jobs. He said: "Today the public prefers to deal with a skilled merchant, whereas years ago a willing attendant could furnish the fuel and oil needs of most cars. Modern cars and drivers have come to depend upon alert service station dealers who will sell them trouble-preventing services and products."

L. T. White, of Cities Service Oil Co., New York, and a member of the API Marketing Division's Personnel Training Committee, discussed the impact of the Virginia program on the nation. He indicated that the Virginia operation would be the forerunner of a nation-wide program within the next few years.

The Virginia plan is organized into two parts. Part I is the coordinated plan for classroom and on-the-job training for students. Part II is an adult education program developed entirely by Schneider. This is expected to become operative sometime next year.

Under Part II, key dealers throughout the state will be urged to participate in the program, consisting of 90 hours of training. Forty hours will be taught by local "DE" coordinators; 10 hours will be credited for a project resulting from training received in the first part; and the final 40 hours will be a one-week college course, in which dealers will attend classes in Personnel Management and Selection, How to Organize, How to Train Employees, and How to Supervise.

When dealers complete the course, they will be given a certificate in Personnel Management and Supervision in the Oil Marketing Industry. After 1956, Schneider said, dealers will need these certificates to participate in the high school training program.

Marsh Tarr, manager of retail sales for Standard Oil Company of Ohio, who attended the Blacksburg meeting as an observer for the American Petroleum Institute's Marketing Division said "The Virginia plan for education of oil marketers could very well be the pattern which API could recommend for all states at its meeting in November."

Socony Mobil's Program Aids Service Station Dealer

Probably the "worst mistake" distributors of petroleum products can make is to fail to give adequate help to the service station dealer to meet his problems, said George D. McDaniel, Eastern Region marketing manager of Socony Mobil Oil Company.

Speaking before the North Carolina Oil Jobbers Association, Mr. McDaniel declared, "Nothing you can do will improve your business more than helping your dealers to become better merchants . . . perhaps the worst mistake a distributor can make is to go on the theory that he has enough of his own headaches and can't take time to help his dealers work out their problems."

The service station dealer, he said, should be kept up to date on developments in selling, management, mer-

chandising, automotive innovations and operating methods.

"While no single point will alone bring remarkable results," he said, "a sound program of working with your dealers will, in the aggregate, mean a great deal . . . It will help the dealer reflect credit on himself, on you and on the brand you represent. It will mean greater service to the community. It will mean greater financial success for all of us in petroleum marketing. It will reduce the threat of harassment by government."

Mr. McDaniel added, however, that the independence of the dealer must in no way be affected by such help.

"While it is important," he said, "to offer all the help you can to your dealer, it is equally important that he be recognized as an independent businessman, free to operate his business as he sees fit, within the conditions of his contract."

Mr. McDaniel observed that most men go into service station dealerships —even though the hours are "long" and the work "sometimes hard and dirty"—because of their desire for a business of their own, where they can derive "certain satisfactions that someone working for a salary or wages does not get."

If a dealer is to get those satisfactions, Mr. McDaniel added, he must be kept aware of "how really independent he is."

Pointing out that Socony Mobil sells through more distributors across the country than any other oil company, he offered additional suggestions for distributors: (1) Keep up with the latest trends and ideas in marketing. (2) Be alert to new markets—recognize change and grow with it. (3) Be active in community projects. (4) Select as dealers men who have an aptitude for running their own businesses; then make sure they have good locations.

OIIC Chairman Discusses Legality of Public Relations

The National Chairman of the Oil Industry Information Committee pointed out anew that it is legally impossible for the industry-wide public relations program to enter any field involving relationships between jobbers and suppliers.

The statement by W. R. Huber, of Gulf Oil Corp., Pittsburgh, Pa., was prompted by the announcement of the South Carolina Oil Jobbers Association that it is "temporarily" withdrawing its support from OIIC, presumably because of jobber-supplier relationships and problems.

Huber's statement, issued in New York, said:

"The OIIC is legally prevented from entering any field involving relationships between supplier and marketer. But even if this were not true, the OIIC would be ill-advised to undertake such a task. Other forums are provided for the airing of these problems."

The National OIIC Chairman also declared:

"We believe that over the years OIIC has amply demonstrated the soundness of its policies and programs in bringing about a better understanding among all oil men, working toward the common goal of making more friends for our industry."

The full statement follows:

"In the formative days of the OIIC nine years ago, many dealer and jobber organizations misunderstood the objectives of the OIIC. There were those who felt, and openly expressed themselves, that one of the functions of the OIIC should be to endeavor to act as intermediary between dealers, jobbers, and supplying companies. It was pointed out at that time, and has been many times since, that the OIIC endeavors to represent the entire industry in order to gain an appreciation on the part of the American public of the tremendous job that the oil industry has done and is doing to provide the consumer with more and increasingly better products at reasonable prices, which contribute so much to our better way of life. Most dealers and jobbers understand this position for there are thousands participating in the OIIC program now, and more are coming along all the time. The purpose of the OIIC can scarcely be better stated than by its adopted objective, which is: "To make clear how well the people of the United States are served by America's oil businesses and to gain support for conditions under which they can continue to be privately managed, fully competitive, and financially sound."

New Products List Issued By Acheson Colloids

A revised 4-page booklet, listing 44 colloidal and semi-colloidal dispersions for operational functions, maintenance, lubrication, machine design, and other industrial applications, has just been issued by Acheson Colloids Co. These products include dispersions of graphite, molybdenum disulfide, mica, vermiculite, zinc, oxide, and acetylene black. Carriers and diluents are given for each product, along with typical applications and important physical data.

Eight entirely new dispersions have been added to this latest revision of Acheson's product list. These include such varied products as a corrosion-resistant coating for dry-film lubrication, an anti-seize compound for oxygen systems, and an improved interior wall coating for cathode-ray tubes.

Copies of "A List of 'dag' Dispersions for Industry" are available free of charge and may be obtained by writing to Acheson Colloids Company, Division of Acheson Industries, Inc., Port Huron, Michigan.

"Effective Selling of Chemicals" Theme of Sales Clinic

The Fifth Annual Sales Clinic sponsored by the Salesmen's Association of the American Chemical Industry will be held at the Roosevelt Hotel, New York, October 24, in conjunction with the Annual Dinner of the Association. General Theme of the Clinic will be "Effective Selling of Chemicals."

The morning session will be devoted to talks by four speakers on the chemical industry and sales technics, and the afternoon session will be devoted to four panel sessions, running concurrently, covering subjects that were discussed in the morning. The morning speakers will be present at the panel sessions, a good portion of which will be devoted to question and answer periods.

The dinner speaker will be Dr. Henry B. Hass, president of the Sugar Research Foundation, whose topic will be "What Will You Be Selling Tomorrow?" At the luncheon, an outstanding business leader, not as yet selected, will discuss "The Impact of the Chemical Industry on Today's Business."

Morning speakers, and their subjects will be as follows: Jack Klein, President of the Klein Institute for Aptitude Testing, Inc., "Were You Born to be an Effective Chemical Salesman"; Robert A. Gopel, Manager of Sales Personnel Development, The Koppers Company, "How an Ordinary Fellow Becomes a Salesman"; W. Edward Keegan, Sales Manager, Shell Chemical Corporation, "The District Office—How to Run It"; and J. Warren Kinsman, Vice-President of E. I. du Pont de Nemours & Co., "You, the Salesman, and Your Management."

U. S. Steel's Researchers Develop Blowout-Proof Tire

A blowout-proof tire for trucks and buses that will outlast the vehicle is now a reality, thanks to a successful research program conducted at the Newburgh Works of U. S. Steel's

American Steel and Wire Division in Cleveland, Ohio.

Here they have developed a high tensile, specially stranded wire for reinforcing cord. One of the nations leading tire manufacturers has started a widespread promotion of its 300,000-mile tire made with the new wire cord and is predicting that the next two years will see a 500,000-mile tire on the market.

Not to be confused with bead wire, which for years has been used in the core of the bead to hold the tire on the rim, the new cord wire is built into the plies, two to four of which are formed in the carcass of the tire.

With a tensile strength of 375,000 to 425,000 pounds per square inch, far in excess of any available fabric cord, wire makes possible a safer, stronger tire with a thinner cross section. This in turn provides greater resiliency and reduces accumulation of heat. The metal-core ply also eliminates casing stretch.

Cord wire is made of high carbon steel and is supplied in coils to the processing line as a hard drawn process wire .033 inches in diameter.

This is specially heat-treated in a 30-foot furnace equipped with six lines, each containing a controlled atmosphere. After leaving the furnace, the wire is quenched, acid cleaned and then cold washed prior to electroplating. The brass plating is done in a 30-foot line.

After plating, the wire is cleansed in boiling water, dried and then coiled. At this point, it is given a tensile test and is also tested for weight of coating.

The coated wire is then drawn through a series of dies which impart approximately a 97 per cent reduction. One foot of process wire elongates to 33 feet of finished drawn wire which is wound on spools in 140,000 foot lengths.

The first step in preparing tire cord is a stranding operation. Three wires are stranded into cord lengths of 22,500 feet. Then seven of the triple-wire strands are layed into lengths of 22,000 feet. After straightening, the cord is ready for use in bus and truck tires.

OIIC Elects Richard Rollins National Chairman

Richard Rollins, secretary of the Atlantic Refining Co., Philadelphia, Pa., was elected 1956 National Chairman of the Oil Industry Information Committee of the American Petroleum Institute at the OIIC's regular quarterly meeting in Chicago today.

The Information Committee operates a nation-wide public relations program on behalf of the U. S. oil industry.

Rollins, who handles his company's public relations affairs, will succeed W. R. Huber, public relations director of Gulf Oil Corp., Pittsburgh, Pa. He will take office early in December.

Vice Chairmen elected at the Chicago meeting were:

Jerry Luboviski, Union Oil Company of California, Los Angeles;

M. S. Hauser, Ohio Oil Company, Findlay, Ohio;

G. A. Mabry, Humble Oil & Refining Co., Houston, Tex.;

Arthur J. De Blois, De Blois Oil Co., Pawtucket, R. I.;

Kenneth W. Rugh, Phillips Petroleum Co., Bartlesville, Okla.

Socony Mobil's Jennings Urges Preservation Of Open Competition

Price wars due to unfair practices by suppliers or dealers are indefensible, but free and open competition must be preserved if our present economic and political system are to survive, B. Brewster Jennings, chairman of the board of Socony Mobil Oil Company, Inc., told the National Petroleum Association at their September meeting.

"It is just as wrong to plead 'competition' as an excuse for unfair business practices as it is to use 'fair trading' to cover up attempts to stifle competition," Mr. Jennings said.

He asserted Socony Mobil does not deliberately initiate price wars of any kind and dislikes them "partly because they cost us a lot of money, but primarily because of their impact on our dealers, through whom most of our products are sold." The big hitch in the various proposals for legislation to stop price wars, Mr. Jennings declared, is that they would also eliminate free competition and therefore would do far more harm than good.

He pointed out that under a system of free and fair competition, the oil industry has been able to improve the quality of its products so greatly while still keeping their prices attractive that "the American motorist

has been able to eat his cake and have it, too." Mr. Jennings documented that statement with these facts: Today's automotive gasoline has a higher octane number and is better in other quality characteristics than the aviation gasoline with which Lindbergh flew the Atlantic in 1927. Yet its price to the motorist, excluding taxes, has risen only about half as much since 1935-39 as the general cost of living.

Mr. Jennings asserted that the American motorist has been able to "hold the line" on gasoline mileage even with heavier cars and softer tires and other things that increase driving comfort and pleasure—automatic transmissions, power brakes, power steering, power windows, power seats, and most recently, air conditioning, all of which get their power from gasoline.

Despite the oil industry's achievements under a free economy, he warned, some people now advocate a change to price regulation and control. One of the panaceas advanced by some, he said, is to place gasoline retailing under public utility type regulation, where prices would be set by government fiat instead of by competition.

Mr. Jennings stated that a government agency could do only one of three things: set the price higher than competition would set it, lower than that point, or at the same point. A higher price would give oil companies a subsidy they do not want, he said; a lower price would ultimately diminish supply, leading to rationing or black markets; a price the same as competition would achieve would mean saddling taxpayers with the cost of a regulatory commission that accomplishes nothing. And, he added, this course of action by government could not guarantee a service station dealer a profit, or even a living.

The fact that some service station dealers favor such legislation poses an obligation to supplying companies to analyze their dealers' problems better and to help those dealers without being paternalistic, Mr. Jennings declared. He cited Socony Mobil's dealer relations program and efforts at better selection and training of dealers.

Returning to his theme of competition versus regulation, Mr. Jennings concluded, "Once we begin to dilute free and fair competition, there is no logical stopping point short of a completely regulated economy. That means stagnation, and ultimately, tyranny."

OIIC Membership Exceeds 30,000

For the first time since its inception in 1947, the number of oil men working as volunteer members of the Oil Industry Information Committee has exceeded the 30,000 mark, National Chairman W. R. Huber announced today.

The Information Committee operates a nation-wide public relations program under the sponsorship of the American Petroleum Institute.

Huber, of Gulf Oil Corp., Pittsburgh, Pa., told a meeting of the OIIC's Steering Committee here in New York that the number of active committeemen, as of July 31, stood at 30,092.

He said this is an increase of 66 per cent in little more than 18 months. The roster of committeemen on January 1, 1954, listed 18,000 volunteers, Huber reported, adding:

"In some ways, this big upswing might be considered phenomenal, but in actuality it merely reflects the steady growth that OIIC has been experiencing in recent years.

"More and more oil men—particularly jobbers and dealers—are realizing the immense value of participation in this information program.

"At the moment, we cannot say exactly how many members of the OIIC are marketers—jobbers and dealers—but the pattern right along has been close to 50 per cent. So I think we can safely estimate that about half of our current membership, 15,000 to be specific, are jobbers and dealers.

"This, of course, is very encouraging for those of us who have been working on this information program for years. We realize that the marketers are the men in closest contact with the public, day in and day out."

Huber said the national OIIC membership picture looked like this:

Atlantic Coast	7,858
Middle West	8,980
Gulf Western	9,368
West Coast	3,886
Total	30,092

General Mills Makes Large Donation to Red Cross

Sixteen thousand pounds of baled cellulose sponge, an amount sufficient to absorb 200 tons of water and silt in one "swish," have been donated to the American Red Cross by the O-Cel-O Division of General Mills for use in cleaning up the Eastern flood disaster area.

The contribution followed a plea by Robert C. Stark, Chairman of the Buffalo Chapter of the Red Cross, for aid from western New York to the flood ravaged area.

The huge shipment of sponge will be trucked today to four cities in the disaster areas for distribution. Three trucking firms—The Inland Express, Trans-American Freight Lines and Rodgers Freight Lines—are providing free delivery service.

Three tons of sponge are being shipped to Hartford, Connecticut, 4500 pounds to Springfield, Massachusetts, 5,000 pounds to Scranton, Pennsylvania, and 500 pounds to Woonsocket, Rhode Island.

Upon notification of the O-Cel-O contribution, E. Roland Harriman, National President of the Red Cross, sent a wire of appreciation to Charles H. Bell, President of General Mills.

The amount of sponge allocated to each of these cities by the Red Cross was based on the number of stricken families which have found their homes hit by mud and silt. The sponge will be distributed to the flood victims for use in cleaning up their homes and stores.

News Continued on page 50

Lithium

Putting the "prod" in production . . .

Here's a bird's-eye view of the biggest step yet in meeting industry's continuing demand for Lithium. Lithium Corporation has put on stream a lithium plant with the largest potential capacity in the world. The $7,000,000.00 project located at Bessemer City, North Carolina is producing Lithium Carbonate and Lithium Hydroxide for industry at large.

Unique in the Lithium industry, Bessemer City is processing run-of-mine ore directly through its chemical plant, as well as concentrates. The former eliminates the once necessary step of first concentrating the ore. The plant treats company-owned deposits of spodumene ore reserves in the adjacent King's Mountain area. The concentrates are from Canadian sources. Coupled with the company's original plant at St. Louis Park, Minnesota, a substantial increase in present productive capacity of the lithium industry is assured.

Lithium Hydroxide and the Grease Industry

Now, for the first time, the grease industry can depend on a continuing source of lithium hydroxide, from inventory and available for immediate shipment. It also means that the industry need no longer hold back on lithium research projects. Company and industry-sponsored research can bank on the closest cooperation from Lithium Corporation's management team.

So, why don't *you* take a look at Lithium? It could hold the key to untold profits for *your* company. A card or letter will bring you complete information.

. . . trends ahead in industrial applications for Lithium.

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MINES: Keystone, Custer, Hill City, South Dakota · Bessemer City, North Carolina · Cat Lake, Manitoba · Amos Area, Quebec
CHEMICAL PLANTS: St. Louis Park, Minnesota · Bessemer City, North Carolina · RESEARCH LABORATORY: St. Louis Park, Minnesota

NEW MEMBER

Climax Molybdenum Company Joins

NLGI Welcomes Climax Molybdenum As an Associate Member

History of Climax Molybdenum Company

Colorado's gold rush in the 1860's and '70's brought hordes of prospectors into the booming camp of Leadville. Wagons and carts laboring over the high mountain passes to this new source of mineral wealth had to skirt a mountain with a large outcropping of an apparently valueless mineral. These pioneers soon learned that the gray material exposed along fracture planes of this ore made a good lubricant for their heavily worn wheel axles. In this fashion the huge deposit of molybdenum on Colorado's Continental Divide, which was to become one of our nation's largest mining enterprises, found its first application.

The deposit passed into private ownership in 1879 when a prospector named Charles Senter staked a mining claim on this 13,863-foot-high peak called Bartlett Mountain. He too was hunting for gold and silver, and did not realize that he had gained title to the world's largest known supply of a vital metal.

Excepting its incidental and local use as a lubricant, however, molybdenum had no known uses when the claim was sold shortly after the turn of the century. The development of the mine at Climax, as the community near timberline in the Colorado Rockies is known, and of moly, as the metal is generally called, followed. By 1912 mining operations had begun, but it was not until 1918, after the formation of the Climax Molybdenum Company, that molybdenite concentrates were produced. The demands of World War I has forced temporary substitution of molybdenum for tungsten in tool steels, but even then molybdenum's value as an alloying agent was only beginning to be realized.

Research and sales development in the 1920's showed that moly-toughened steel had a big future in the automobile industry and the mine began regular operations in 1924 that have expanded ever since. World War II, with its demands for tough alloys to be used in tools, tanks, guns, and machinery, really gave moly its big boost. Postwar developments demanding high heat-resistant alloys for jets, rockets and guided missiles and newly discovered chemical uses for moly assure further growth.

Concentrate from the mill is shipped to the Climax conversion plant at Langeloth, Pa., a small city about 30

Climax, Colorado, located just below timberline at the foot of Bartlett Mountain in the Rockies, can produce 42,500,000 pounds of molybdenum a year.

miles west of Pittsburgh. There, by roasting, the concentrate is converted into technical molybdic oxide, about 25 per cent of which is marketed as such. The remainder is further processed into calcium molybdate; ferromolybdenum; pure molybdic oxide for the chemical industry; molybdic oxide briquettes; sodium molybdate; molybdenum silicide for alloying purposes; nickel-molybdenum and cobalt-molybdenum master alloys; purified molybdenum disulfide for lubrication; and technical thermite molybdenum, a metal containing 95 per cent moly.

Today the bulk of moly produced still finds its principal use as an alloy to impart such properties as toughness, high-temperature resistance and corrosion resistance to steel and cast iron. The greatest amount goes into steel for automobiles, machine tools, welding rods, tractors, farm machinery and heavy industrial equipment. Another large consumer is the oil industry which uses moly in drill pipe, sucker rods, kelly bars, drill collars, tool bits and tubes in cracking stills.

Climax's development program is expanding moly's applications not only in the metallurgical field but in other directions such as chemicals. Here too, the oil industry is a big consumer, for 1,200,000 pounds of moly is going into catalysts for upgrading petroleum and numerous other chemical processes. Pigments for paint are another established use, and new markets are promised in agriculture, where moly is a vital element in plant nutrition.

Climax's faith in the future of molybdenum disulfide in lubrication and the current growth being indicated in this product has led to the establishment of a new research and development program on that material—and to its joining NLGI.

Molybdenum disulfide functions as a lubricant additive because of its affinity for metal, unique laminar structure, low co-efficient of friction and load-carrying capacity. It retains these properties over a wide range of temperature and at extreme pressures, and is virtually inert chemically.

Climax feels that these properties will be most widely exploited by using moly sulfide as a lubricant additive to increase effective lubrication under mechanical conditions too extreme for the lubricant alone. To that end, it will make the results of its research available to industry as well as serve as a clearing house for all technical data bearing on the use of this compound in lubrication.

The program will be carried out at the Detroit Research Laboratory but as information is developed, it will be available from the New York office and Climax's other offices in this country and abroad.

Climax is diversifying not only its molybdenum markets, but its corporate interests as well. In 1950, the company entered the uranium mining and milling business through a newly formed subsidiary, Climax Uranium Co. It has also established an exploration department within the parent company with the aim of developing new long-range mining ventures. Through its oil department, Climax is also active in the oil business. Most of its oil properties are held and operated in cooperation with other companies. In 1954, however, Climax acquired some Oklahoma properties that are managed by its Climax- Brundred Waterfloor Division.

NLGI Technical Committee Representative

The new technical committee member from Climax Molybdenum Company, E. Kendrick Leavenworth, brings to NLGI a life-long interest in things mechanical, challenging and new.

He was born in Cleveland, and grew up in Detroit. He attended Northern High School in Detroit and Roxbury School in Cheshire, Connecticut, following which he entered Yale's Sheffield Scientific School. Graduating with a B.S. in Civil Engineering in 1928, he entered the building construction field in a family-operated enterprise.

But Mr. Leavenworth gradually realized that his interest in mechanical and electrical problems was not being satisfied in that role, and in 1943 he joined the Detroit Research Laboratory of Climax Molybdenum Company as a mechanical engineer. Here he found ample opportunity to put his mechanical and electrical talents to good use in the metallurgical, chemical and X-ray departments of the laboratory. There is solid evidence of this in the equipment and techniques he developed for vacuum arc-casting of molybdenum and its alloys and in the patents issued to him (U. S. 2,651,952 and 2,656,743) for devices employed in forming the continuous electrodes required in that process. His technical versatility and willingness to tackle varied problems made him a logical choice to head the new Climax research program on the lubricant additive, molybdenum disulfide.

Mr. Leavenworth is a member of the American Radio Relay League and holds Amateur Radio License W8AJS, the same call sign he was granted in his grammar school days when he became interested in electricity. He is a member of the Ameri-

NLGI Technical Representative

E. Kendrick Leavenworth

NLGI Company Representative

Elwin E. Smith

can Society of Metallurgists and the Society of Automotive Engineers.

NLGI Company Representative

Elwin E. Smith, Climax Molybdenum's NLGI company representative, is no stranger in the grease field for most of his business life has been spent in the petroleum industry developing markets for and selling lubricants as well as other petroleum products.

A 1944 chemical engineering graduate of the University of Alabama, he served in the U. S. Army from 1943 to 1948, becoming a divisional staff officer in the Parachute Troops. Upon his discharge, he worked as a sales engineer for Diamondhead Oil Company. In 1949 he joined Cities Service Oil Company where he successively was sales engineer for general petroleum products, sales manager for petroleum waxes and sales manager for industrial lubricants in the New York area. With the expansion of the chemical development division of Climax this spring, Mr. Smith joined the company as manager of lubricant development in that division. His principal duties concern development of markets for the new lubricant additive, molybdenum disulfide. His office is at Climax headquarters in New York City.

Mr. Smith is married and has three children. His professional affiliations include the American Society of Lubricating Engineers and the American Petroleum Institute.

Rheem Manufacturing to Recondition Drums

Entry of the world's largest producer of steel shipping containers into the multi-million-dollar reconditioned drum business was revealed today, as Rheem Manufacturing Company announced preliminary plans to enter the reconditioned drum field in the San Francisco Bay Area and in Southern California.

Gordon W. Mallatratt, vice president and general manager of the company's Rheem Products Division, also announced the appointment of T. T. Merry, a veteran in the Pacific Coast reconditioned drum industry, to an executive post with the Rheem organization as a part of the move.

"Our decision to enter the reconditioned drum field is based on a plan to expand Rheem's west coast packaging services, which already include steel and fibre containers," Mallatratt said. "This step will broaden our packaging line, enabling us to better supply the needs of the petroleum, chemical, paint, food and other industries. An indication of this is the fact that we have named one of the most experienced men in the west to head up the Rheem reconditioned drum program."

T. T. Merry, who left an executive position with Myers Barrel Company, Oakland, to join Rheem June 1, entered the reconditioned drum field with his father, S. B. Merry, at Berkeley in 1940.

Rheem Manufacturing Company operates through 14 domestic plants and 17 overseas plants, producing a wide range of products for the home, industry and the military. The Rheem steel container business ranges from plants at Richmond and South Gate, California to Houston, New Orleans, Chicago, Linden, N. J. and Sparrows Point, Md.

Fuel and Oil to Be Available For Private Jet Planes

Speed-conscious executives interested in private jet planes, like the four-place 410 mile-an-hour French jet introduced in America this month, will find fuel and oil ready for them whenever they are ready to fly such planes, according to J. S. Harris, Shell Oil Company's aviation manager. Shell is the primary fuel and oil supplier for the nationwide tour of the MS-760, a four-place, twin-engine jet being demonstrated by the Beech Aircraft Corporation.

He said there has been some question about fueling jet-powered executive aircraft because the fuel they burn is not now available at most airports. This presents no problem, Harris said, because fuel for jet-powered aircraft will be available to the several hundred Shell Airport Dealers throughout the country as soon as there is a demand for it. The special oil they require will also be available to Shell Airport Dealers, he said.

General Mills Announces Separate Division of Soybean Operations

President Charles H. Bell of General Mills announced today that the company's soybean operations which are now part of the Chemical Division will be established as a separate division effective October 1.

The change means that soybeans, which are processed at Belmond, Iowa, and Rossford, Ohio, and the Fatty Acid operations, located at Kankakee, Illinois, will each receive division status. Fatty Acids and specialty chemical products will continue as the Chemical Division.

The reorganization was recommended by Sewall Andrews, for the past two and one-half years Manager of the Chemical Division, and Arthur D. Hyde, Vice President and Administrator of Mechanical and Chemical Operations, after detailed studies.

Andrews will be General Manager of the new Soybean Division. In a bulletin announcing the new unit, President Bell praised Andrews for his leadership as General Manager of the Chemical operations and noted the improvements that have taken place in Kankakee operations under his leadership.

Bell announced the appointment of William D. Mitchell as General Manager of the Chemical Division. For the past 20 years Mitchell has been associated with the Pennsylvania Salt Company, most recently as Vice President in Charge of Operations.

FUTURE MEETINGS of the Industry

OCTOBER, 1955

9-15 American Petroleum Institute Oil Progress Week

10-12 American Oil Chemists' Society (Fall meeting), Bellevue-Stratford Hotel, Philadelphia, Pa.

10-12 American Society of Mechanical Engrs. (lubrication conference), Antlers Hotel, Indianapolis, Ind.

11-15 Society of Automotive Engineers, Hotel Statler, Los Angeles, Calif.

12-13 South Dakota Independent Oil Men's Assn., Mitchell, S. D.

12-13 Indiana Independent Petroleum Association (annual meeting), Severen Hotel, Indianapolis, Ind.

12-13 South Dakota Independent Oil Men's Assn., Mitchell, S. D.

13-14 California Natural Gasoline Assn. (annual Fall meeting), Ambassador Hotel, Los Angeles, Calif.

13-16 Louisiana Gulf Coast Oil Exposition, Lafayette, La.

14 Mid-Continent Oil & Gas Association (annual membership meeting, Kansas-Oklahoma Division), Tulsa Club, Tulsa, Okla.

14 American Institute of Chemical Engineers (annual technical meeting), Galvez Hotel, Galveston, Tex.

14-15 National Society of Professional Engineers (fall meeting), Peabody Hotel, Memphis, Tenn.

18-22 National Safety Council (43rd National Safety Congress and Exposition), Chicago, Ill.

18-19 Nebraska Petroleum Marketing, Inc. (annual meeting), Paxton Hotel, Omaha, Nebr.

19-21 Petroleum Marketers Association of Texas (annual meeting), Adolphus Hotel, Dallas, Tex.

20 Arkansas Independent Oil Marketers Association (annual meeting), Lafayette Hotel, Little Rock, Ark.

20 National Petroleum Council, South Interior Building, Washington, D. C.

20 West Virginia Petroleum Assn. (Annual Meeting), Daniel Boone Hotel, Charleston, W. Va.

20-21 Western Petroleum Refiners Association (regional technical industrial relations meeting), Garrett Hotel, El Dorado, Ark.

23-25 Pennsylvania Petroleum Association, Pocono Manor Inn, Mt. Pocono, Pa.

23-25 National Association of Oil Equipment Jobbers (5th Annual Meeting), Hotel President, Kansas City, Mo.

24-26 American Standards Assn. (annual meeting), Sheraton Park Hotel, Washington, D. C.

27-29 Rocky Mountain Oil & Gas Assn. (annual convention), Cosmopolitan Hotel, Denver, Colo.

27 Virginia Petroleum Jobbers Association, Roanoke Hotel, Roanoke, Va.

28 Virginia Oil Men's Association, Roanoke Hotel, Roanoke, Va.

28 Natural Gasoline Association of America (regional meeting), Captain Shreve Hotel, Shreveport, La.

31 to Nov. 1 Independent Petroleum Assn. of America (annual membership meeting), Jefferson Hotel, St. Louis, Mo.

31 to Nov. 2 NLGI ANNUAL MEETING, EDGEWATER BEACH HOTEL, CHICAGO, ILL.

31 to Nov. 2 Society of Automotive Engineers (transportation meeting), Chase Hotel, St. Louis, Mo.

30-31 Nov. 1-2 Empire State Petroleum Assn. Inc. (Fall meeting), Concord Hotel, Kiamesha Lake, N. Y.

NOVEMBER, 1955

2-4 Society of Automotive Engineers (diesel engine meeting), Chase Hotel, St. Louis, Mo.

2-4 National Oil Jobbers Council (annual meeting), Sherman Hotel, Chicago, Ill.

Continued on page 57

Molecular model shows the complex chemical structure of new ADM fatty alcohols.

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1 Introduction
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8 Barium Base Lubricating Greases
9 Calcium Base Lubricating Greases
10 Lithium Base Lubricating Greases
11 Sodium Base Lubricating Greases
12 Lead Soap Lubricating Greases
13 Strontium Base Lubricating Greases
14 Miscellaneous Metal Soaps as Components of Lubricating Greases
15 Mixed Base Lubricating Greases
16 Complex Soap Lubricating Greases
17 Non-Soap Thickeners for Lubricating Fluids
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22 Application of Lubricating Greases
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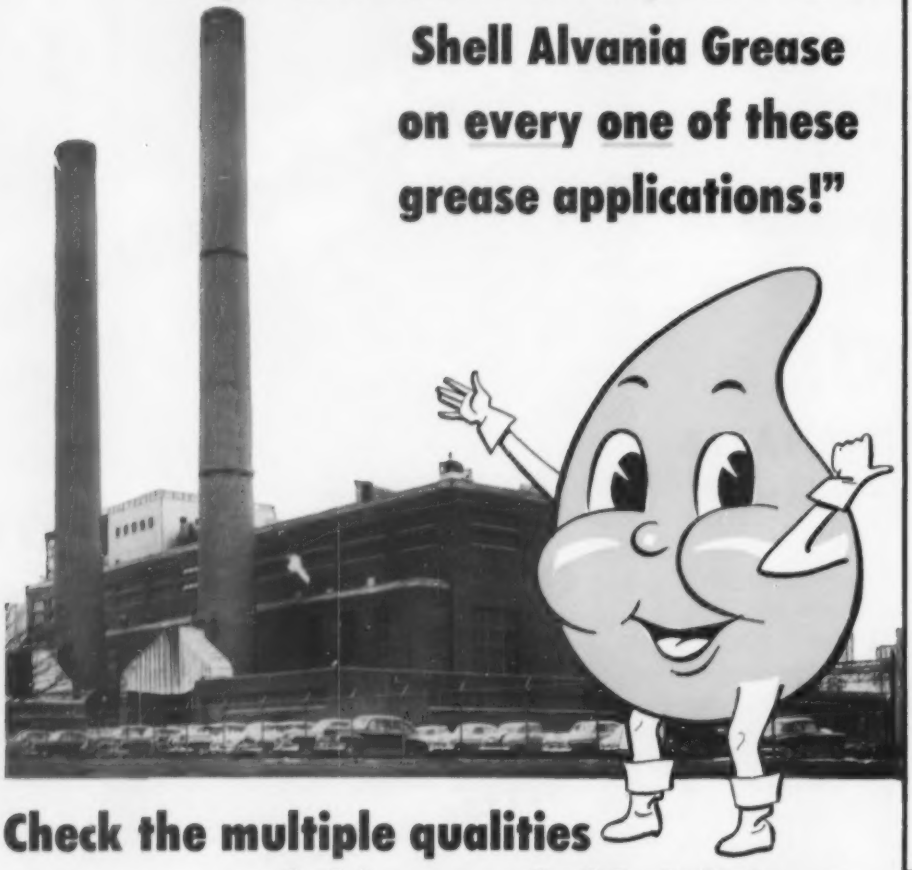

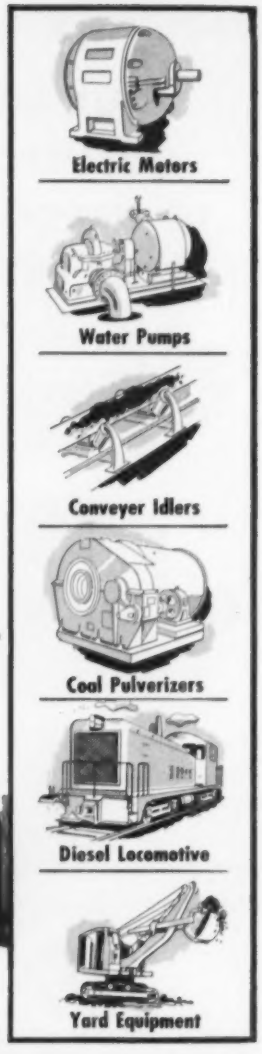

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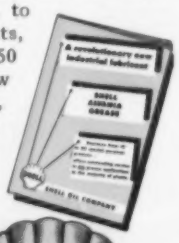

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Future Meetings

Continued from page 2

9-10 Society of Automotive Engineers (fuels and lubricants meeting), Bellevue-Stratford Hotel, Philadelphia, Pa.

13-18 American Society of Mechanical Engineers (75th anniversary meeting), Hilton & Blackstone Hotels, Chicago, Ill.

14-16 American Petroleum Credit Association, Carter Hotel, Cleveland, Ohio.

14-17 American Petroleum Institute (35th annual meeting), Mark Hopkins, Fairmont, St. Francis, and Palace Hotels, San Francisco, Calif.

14-18 Chicago Exposition of Power and Mechanical Engineering (ASME), Coliseum, Chicago, Ill.

16 American Petroleum Institute (OIIC Steering Committee meeting), San Francisco, Calif.

17 National Industrial Conference Board (general session), Bellevue-Stratford Hotel, Philadelphia, Pa.

18-22 National Safety Council and National Safety Congress and Exposition, Chicago, Ill.

20-21 Western Petroleum Refiners Association (regional technical and industrial relations meeting), Garrett Hotel, El Dorado, Ark.

27-30 American Institute of Chemical Engineers (annual meeting), Statler Hotel, Detroit, Mich.

30 Mid-Continent Oil & Gas Association (annual meeting, Board of Directors), Tulsa Club, Tulsa, Okla.

DECEMBER, 1955

1-3 American Chemical Society (Southwest meeting), Shamrock Hotel, Houston, Tex.

1-3 Interstate Oil Compact Commission, La Fonda Hotel, Santa Fe, N. M.

5-9 25th Exposition of Chemical Industries, Commercial Museum and Convention Hall, Philadelphia, Pa.

6-7 Petroleum Packaging Committee of Packaging Institute, Benjamin Franklin Hotel, Philadelphia, Pa.

8-9 American Petroleum Institute (OIIC meeting), Waldorf-Astoria Hotel, New York, N. Y.

11-14 American Society of Agricultural Engineers (Winter meeting), Edgewater Beach Hotel, Chicago, Ill.

JANUARY, 1956

9-13 SAE Annual Meeting, Sheraton-Cadillac Hotel and Hotel Statler, Detroit, Mich.

10-12 Kentucky Petroleum Marketers Assn. (30th annual meeting), Brown Hotel, Louisville, Ky.

25-26 Northwest Petroleum Association (annual convention), Nicollette Hotel, Minneapolis, Minn.

30 to
Feb. 3 American Institute of Electrical Engrs. (1956 Winter general), Statler Hotel, New York, N. Y.

FEBRUARY, 1956

22-23 Iowa Independent Oil Jobbers Association, Inc. (convention), Fort Des Moines Hotel, Des Moines, Ia.

MARCH, 1956

7-9 American Petroleum Institute (Division of Production, Southern District Meeting), Plaza Hotel, San Antonio, Tex.

12-16 National Assn. of Corrosion Engrs. (annual convention), Statler Hotel, New York, N.Y.

19-21 Western Petroleum Refiners Association (annual meeting), Plaza Hotel, San Antonio, Tex.

20-22 Ohio Petroleum Marketers Assn., Inc. (Spring Convention & Trade Exposition), Deshler-Hilton, Columbus, Ohio.

21-23 American Petroleum Institute (Division of Production, Southwestern District Meeting), Texas Hotel, Fort Worth, Tex.

APRIL, 1956

2-4 American Institute of Electrical Engrs. (Southwest District No. 7), Dallas, Texas.

16-20 Greater New York Safety Council (annual convention and exposition), Statler Hotel, New York, N. Y.

18-20 National Petroleum Association, Cleveland, Ohio

22-26 National Tank Truck Carriers, Inc., Shoreham Hotel, Washington, D. C.

30 to
May 1 Independent Petroleum Association of America (semiannual meeting), Statler Hotel, Los Angeles, Cal.

30 to
May 2 Chamber of Commerce of the United States (annual meeting), Washington, D. C.

30 to
May 4 American Petroleum Institute (safety and fire protection mid-year meeting), Warwick Hotel, Philadelphia, Pa.

JUNE, 1956

3-8 SAE Summer meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

17-22 ASTM 59th Annual Meeting and 12th Apparatus Exhibit, Chalfonte-Haddon Hall, Atlantic City, N. J.

SEPTEMBER, 1956

7-8 Desk & Derrick Club, New Orleans, La.

12-14 National Petroleum Association, Atlantic City, N. J.

16-22 ASTM 2nd Pacific Area National Meeting and Apparatus Exhibit, Hotel Statler, Los Angeles, Calif.

NOVEMBER, 1956

1-2 SAE National Diesel Engine Meeting, Drake Hotel, Chicago, Ill.

8-9 SAE National Fuels and Lubricants Meeting, The Mayo, Tulsa, Okla.

APRIL, 1957

16-18 National Petroleum Association, Cleveland, Ohio

JUNE, 1957

16-21 American Society for Testing Materials, Chalfonte-Haddon Hall, Atlantic City, N. J.

SEPTEMBER, 1957

11-13 National Petroleum Association, Atlantic City, N. J.

APRIL, 1958

16-18 National Petroleum Association, Cleveland, Ohio

JUNE, 1958

22-28 ASTM 61st Annual Meeting, Hotel Statler, Boston, Mass.

SEPTEMBER, 1958

10-12 National Petroleum Association, Atlantic City, N. J.

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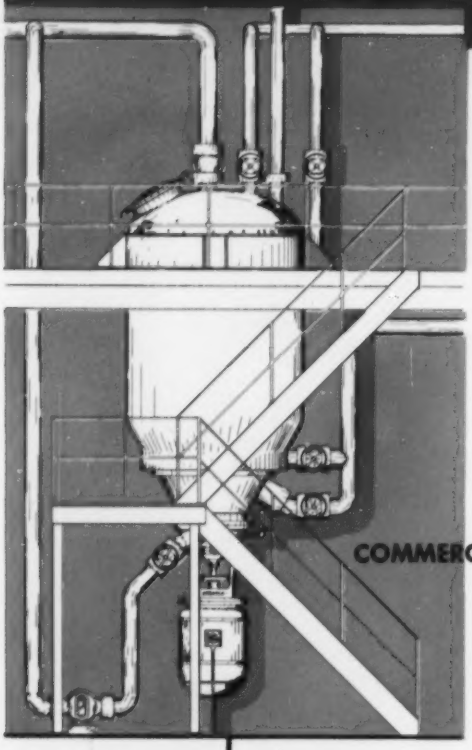

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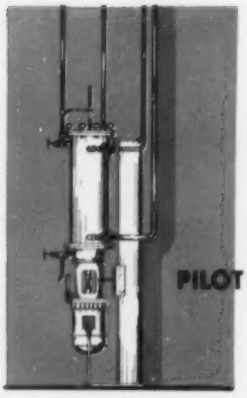

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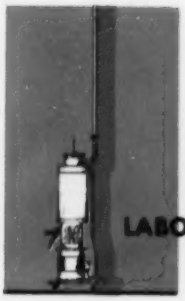

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